

Landscape Manual For Durham, North Carolina



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Editor's Note (June 1, 2013): Please be advised that after this *Landscape Manual* was adopted by the Durham Joint City-County Planning Committee on April 3, 2013, the Durham City Council approved related changes to the Unified Development Ordinance (UDO) that were effective on June 1, 2013. The changes include references to this *Landscape Manual*, and some landscape-related requirements that were moved into this document from the UDO. One example is a new required minimum root area for trees that is based on specific tree species in the Allowed Trees tables instead of a general UDO requirement based on the Development Tier in which the trees will be planted. As of June 1, 2013, the Durham Board of County Commissioners had not approved an amendment to the UDO that would make these changes effective in the County jurisdiction. Thus, for County jurisdictional purposes only, all information in this *Manual* is to be considered the recommended best practice, including those labeled as **Required** or **Requirements**, unless it is also required in the County version of the UDO.

1. Introduction

The information included in this *Landscape Manual for Durham, North Carolina (Landscape Manual)* applies to all new development governed by the permitting process defined in the Durham Unified Development Ordinance (UDO)*. Property developed or substantially changed under a permit approved by the Durham City-County Planning Department is subject to the Ordinance-based requirements of this *Landscape Manual*. Periodic updates to the *Landscape Manual* may be made by the Planning Department after review and approval by the Joint City-County Planning Committee.

A. Application. The *Landscape Manual* is a compilation of the latest accepted horticultural practices. It is meant to be used by development and design professionals, landscape contractors, individual citizens, and Planning Department staff to maximize the chances for success of newly installed landscape plantings. There are two primary components of this document, as listed below:


1. **Required** elements for landscaping required by the UDO include, but are not limited to:
 - a. Information labeled as **Required** in Section 2, Procedures and General Requirements; Section 3, Tree Preservation and Care Before and During Construction; and Section 4, Selection of Plant Material;
 - b. Information labeled as **Required** in Sections 5A, Site and Soil Preparation; 5E, Irrigation (as per City Code); 5F, Mulching Shrubs and Trees (as per City Code); and 5I, Turf;
 - c. The Required Tree Planting Detail provided in Figure 1;
 - d. The Required Tree Protection Fence Detail provided in Figure 4;
 - e. The Required Minimum Root Area (Trees) defined in Figure 6, Plant Table Key, and as specified for individual trees in Tables 1A through 1H, Allowed Trees;
 - f. The categories of Allowed Locations for Use of Required Plant Materials in Section 4C, and as specified for individual plants in Tables 1A through 1H, Allowed Trees, and Tables 2A through 2D, Allowed Shrubs;
 - g. Table 3, Trees Not Allowed for Ordinance-Required Planting Credit;
 - h. Table 4, Plants Not Allowed for Ordinance-Required Planting Credit; and
 - i. Table 5, Plants Prohibited for Any Use.
2. **Recommended** practices to be followed in order to maximize the survivability and success of these plantings. The recommended or informational elements include suggestions for best landscape management practices for the installation and maintenance of plant materials and other landscaping elements. They include:
 - a. Information labeled as **Recommended** in Section 2, Landscape Plans; Section 3, Tree Preservation and Care During Construction; Section 4, Selection of Plant Material; and Section 5, Successful Groundcover, Shrub, and Tree Installation;
 - b. The Recommended and Example details found in Figures 2, 3, and 5;

- c. The Recommended Cultural Information in the Plant Table Key found in Figure 6, as labeled in Tables 1A through 1H, Allowed Trees, and Tables 2A through 2D, Allowed Shrubs; and
 - d. The “💧 **Water-Wise Tips:**” found throughout the *Landscape Manual*.
- B. This *Landscape Manual* will be used by staff to assess proposed Ordinance-required landscape installations. The information is designed as a supplement to landscaping requirements set forth in the UDO. All persons who design and/or install Ordinance-required landscape material are expected to follow the required parameters of this Manual. Failure to follow the required element parameters can result in any or all of the following:
 - 1. Issuance of a stop work order;
 - 2. Failure to be approved for Certificate of Compliance; and/or
 - 3. Issuance of a Zoning Notice of Violation.
- C. Durham is a North Carolina WaterWise Partner. The *Landscape Manual* incorporates water-wise landscaping principles. Specific passages are highlighted with a “💧 **Water-Wise Tip:**” symbol to emphasize opportunities for efficient use of water within the landscape. The seven principles of Water-Wise Landscaping include:
 - 1. Planning and design;
 - 2. Soil improvement;
 - 3. Practical turf areas;
 - 4. Efficient use of watering and irrigation;
 - 5. Use of mulch;
 - 6. Water-appropriate selection of plant materials; and
 - 7. Appropriate maintenance practices.
- D. **Coordination with Other City or County Requirements** There are some plants not listed in the *Landscape Manual* which can be utilized to meet other City and/or County requirements. Specifically, plants listed in the Section 8.3 of the *City of Durham Reference Guide for Development*, or in Chapters 9 and 12 of the *NC DENR Stormwater BMP Manual*, for use in stormwater best management practices (BMPs) or stormwater control measures (SCMs), but not otherwise listed in the *Landscape Manual*, are not subject to approval through the *Landscape Manual*, and can be used for these specific applications.

2. Landscape Plans

- A. Required Content.** Landscape plans shall be prepared by a person demonstrating knowledge and experience in the field of landscaping and/or site design such as a landscape architect, landscape designer, landscape contractor, or horticulturist. The landscape plan shall adequately detail the requirements of the UDO and this *Manual*. Plans shall include the following:
1. A plant list or table showing: quantity, scientific names, common names, sizes, and intended uses; and a key that identifies the species of all plant material on the landscape plan. It may also contain notes that further define characteristics of the plant that the designer wants in the plant selection (e.g. "matching specimens").
 2. The size of the proposed plant material. Sizes of upright shrubs, as described in UDO paragraph 9.2.3C, shall be specified by height only. Tree sizes, as described in UDO paragraph 9.2.3B, shall be shown by caliper and/or height, as applicable. Container sizes are not allowed to be used in lieu of height and caliper. If provided, a note must be included on the plant list stating that: "All plant materials must meet or exceed all sizes shown at the time of installation."
 3. The location of all required landscape materials, including trees, shrubs, and structural elements, both existing and proposed.
 4. The planting area (in square feet) proposed to be provided for each tree. The planting area shall meet or exceed the minimum required root growth area for the applicable species listed in Tables 1A through 1H, Allowed Trees.
 5. The location of preserved tree coverage and tree replacement areas, as applicable.
 6. The location of tree protection fences and silt fences.
 7. Proposed drives, paving areas, decks, walks, pools, and other man-made structures, elements, and utilities which are to remain or be constructed on the property.
 8. All construction notes and details relating to construction, specific material, and planting procedures.
 9. Demonstration of compliance with the driveway/intersection sight distance triangle requirements in UDO paragraph 12.3.1D, safe sight distances within parking lots per paragraph 9.8.1C. Plants located within driveway medians, at the ends of parking lot islands, and within sight distances shall be a species with a maximum mature height of no more than 30 inches, per paragraph 9.8.1C.
 10. Per UDO paragraph 9.2.5A, Easements, plantings proposed within easements shall be approved by the utility provider. Trees proposed for planting within overhead electrical line (power line) easements also shall utilize tree species approved for use under the power lines by the operating utility. Some of these allowable trees are noted with a "Y" in the "Street Trees - Under Power Lines" column of the "Approved Use Categories" portion of **Tables 1A through 1H, Allowed Trees**. Specific written permission from the utility operating the easement shall be provided for any trees proposed for planting within overhead utility easements other than those so allowed in the *Landscape Manual*.

B. Recommended Design Considerations

 **Water-Wise Tip:** Shrub, annual, perennial, and turf grass areas have different water requirements. Reduce over-watering by grouping plants with similar water needs into separate irrigation zones.

1. Planting trees under overhead utilities should be avoided. However, in some cases, an overhead utility is not located within an easement (or a public right-of-way). In these cases, it is recommended that tree plantings have a minimum setback of 30 feet from the centerline of an overhead utility. If a tree needs to be planted within this recommended set-back, only tree species approved for use under power lines should be planted.
2. Plants should not be placed where they will block or interfere with the operation of site features and utilities. Location of plantings near utilities such as those associated with fire safety, site lighting, water and sewer connections, and electrical access can result in violation of other City and County Code and Ordinance requirements. Therefore, the designer should show the location of all proposed utilities to verify that there are no conflicts with either underground or above-ground utilities. City, County and State departments and agencies that review site plans will comment on plant location proposals which violate their design manuals and ordinances. On planting plans, site utilities can be shown as half-toned to make it easier to see the proposed plantings, and their relationship to the utilities.
3. Avoid conflicts between trees and site lighting. Tree shadows can interfere with lighting performance, which could result in a violation of UDO utility requirements. Pruning of the obstructing trees could result in the loss of an Ordinance-required tree, resulting in possible violation of the Ordinance. To avoid such conflicts, the site designer should provide a minimum 15 foot horizontal clearance from the tree-trunk center to the center point of overhead lighting elements. If a fastigate or columnar tree species is used, the required horizontal clearance can be reduced to a minimum of five feet.
4. Show location of proposed irrigation lines and sprinkler heads (if proposed).

3. Tree Preservation and Care Before and During Construction

A. Tree Preservation (See Paragraph 8.3.2 of the UDO)


1. Required Procedures

- a. Per UDO paragraph 8.3.2, Protection of Existing Vegetation, areas of vegetation to be preserved in order to meet Ordinance requirements shall not be disturbed or encroached upon. Allowed activities in “Preserved Tree Coverage” areas are listed in UDO paragraph 8.3.1D.5.
- b. Install tree protection fencing around areas of vegetation to be preserved in accordance with paragraph 8.3.2 of the UDO. See Figure 4, Tree Protection Fence Detail, for an example detail of the tree protection fencing.
- c. The minimum size of the “Tree Preservation Area” shall be the area within the root protection zone (RPZ) of the tree or group of trees to be preserved. Additional area can be preserved.
- d. When installing tree protection fencing for preserved trees along a wood’s edge, the fence shall be located at the edge of the RPZ of the outermost-protected trees, and on the wooded side of any silt fencing to be installed in the same location. Using silt fencing, or combining tree protection and silt fencing into one fence, is prohibited for tree protection, per UDO paragraph 8.3.2C.
- e. Tree protection fencing, including warning signs as required in UDO paragraph 8.3.2E, shall be installed prior to starting any grading or land disturbing activity.
- f. The location of the tree protection fencing shall be inspected and approved prior to starting any grading or land disturbing activity. For projects requiring a Land Disturbance Permit, call the Durham County Engineering and Environmental Services Stormwater and Environmental Division (919-560-0735), to request a Sedimentation and Erosion Control Officer visit the site to approve the placement of the fencing. For projects that do not require a Land Disturbance permit, contact the City-County Planning Site Compliance staff (919-560-4137) to schedule an inspection of the fencing prior to beginning land disturbing activities.
- g. In order to protect the RPZ of a tree to be preserved, contractors performing grading and other land disturbance activities near tree preservation areas shall perform such activities in accordance with UDO paragraphs 8.3.2D and E.
- h. Trees with more than a third of their roots pruned or removed are unlikely to survive. See UDO paragraph 8.3.1 and 9.3.2 for the minimum percentages of RPZ required to be protected for specific use applications of preserved trees. If existing trees, which are identified to be preserved in order to meet Ordinance requirements, have more of their RPZ damaged than the required minimum percentages during or after development activities, a revised land disturbance tree survey (see UDO paragraph 8.3.3.D) and revised site plan shall be required in order to remove those trees from the plan. Tree coverage calculations shall be adjusted accordingly. The developer shall be required to demonstrate that the amount of

required tree coverage area is still being provided, including additional tree coverage areas if required.

2. Recommended Procedures

Developers, designers, and contractors can contact the Planning Department Site Compliance staff to arrange a site visit for an evaluation of tree protection areas, and permission to remove invasive, damaged and/or diseased plant material, prior to doing any of these activities.

 **Water-Wise Tip:** Preservation of existing trees is preferable over tree replacement for several reasons:

- Existing trees require no water to become established and can typically be maintained with rainfall.
- Areas of tree coverage absorb rainfall and allow for groundwater recharge on site.
- Undisturbed soils prevent moisture loss that can occur when soils are graded and exposed to air.

B. Root Pruning Prior to Construction

1. Required Procedures

- a. Root pruning shall be done on single, existing, City-owned trees (and at the edge of City- and/or County-owned wooded areas) located near proposed construction prior to the start of land disturbing activities, where such activities are to occur within the RPZ of such trees at a depth of 10 inches or more. No root pruning of a City Tree shall occur within six feet of such a tree without the approval of the Urban Forestry Manager.
- b. Cut roots no more than six inches back from new construction. Cuts shall be made to a maximum depth of two feet, with a sharp, vertical cut using an implement that will cleanly cut the root.

2. Recommended Procedures

- a. Root pruning implements can be anything from a sharpened shovel, loppers, pruning saw, pavement saw, or similar sharp cutting tool. Circumstances and availability will dictate which tools will be best fit for the pruning application. Most vibrating plows, stump grinders, pavement saws and sharp hand-tools can be acceptable as long as the root is cleanly cut, and not mashed or torn.
- b. Backfill with clean, dry soil, or compost within eight hours of root pruning. Moisten soil immediately after backfilling.

4. Selection of Plant Material

A. Plant Selection

1. Required Plant Selection Practices and Plant Tables

a. Plant Tables.

- (1) As per UDO paragraph 9.2.3, Plant Material Requirements, plant material selections shall be made for Ordinance-required plantings in accordance with the tables provided in this *Landscape Manual*. Plants allowed to be used for Ordinance-required plantings, and generally well-suited to Durham's climate and soil conditions, are listed in **Tables 1A through 1H, Allowed Trees**, and in **Tables 2A through 2D, Allowed Shrubs**.
- (2) These tables, found at the end of this section, include the category of use locations, such as urban street trees or parking lots, where trees and shrubs are allowed to be used to meet Ordinance requirements. Some plants are listed in more than one table because either the species, or at least one cultivar, has characteristics that are suited to that table and category of use location.
- (3) The plants in each table are listed in alphabetical order by their accepted horticultural or Latin name. The 2009 edition of *The Manual of Woody Landscape Plants, Their Identification, Ornamental Characteristics, Culture, Propagation, and Uses*, by Michael A. Dirr, was the main source of the plant names listed in these tables. However, plant names change over time, and there may be some differences between the names listed here and in another source; and where a more up-to-date name was discovered, it has been included. It is assumed that additional updates will continue to be needed over time.


- b. Plants Not Allowed.** Trees and other plants that are not recommended for use due to invasive tendencies, disease, lack of hardiness, or other factors are listed in **Table 3, Trees Not Allowed for Ordinance-Required Plantings**, and **Table 4, Plants Not Allowed for Ordinance-Required Plantings**. No landscaping credit is allowed for use of these plant materials. **Table 5, Plants Prohibited for Any Use**, lists plant species that are recognized by the North Carolina Botanical Garden or by the United States Department of Agriculture Forest Service, Southern Research Station, for their invasive tendencies, and shall not be planted as landscaping for any purpose.

- c. Approval of Plants Not in the Tables.** Plants not found in any of the Allowed Trees or Allowed Shrubs tables can be approved for use if the proposed plant meets the specific location and use criteria in Section 4C, Criteria for Determining Allowed Locations for Use of Ordinance-Required Plant Material, of this *Landscape Manual*. Additionally, the plant must be suitable for the proposed growing environment, and have a non-invasive nature (or, if the plant has invasive tendencies, they would not be manifested under the proposed planting conditions). These three items must be documented and sealed by a qualified and registered/licensed plant professional, either a North Carolina Certified Plant Professional, a North Carolina Registered Landscape Contractor, or a North Carolina Registered Landscape Architect. The required documentation shall be provided to the Planning Director or designee for each such plant proposed for use in an Ordinance-required planting.

Recommendations for additions to the Allowed Plant lists can similarly be made to the Planning Director or designee, to be included in periodic updates to the Tables, if the plants are so qualified.

2. **Recommended Plant Selection Parameters.** The degree of tolerance of a plant to drought and/or wet conditions is indicated by a numeric value as set forth in the “Established Plant Wet/Dry & Soil Tolerance” portion of the Plant Table Key found in Figure 6. The numeric value assigned to each plant is provided in the appropriately named column under the “Recommended Planting Conditions” portion of the plant tables. Please keep the following in mind when selecting plants for drought-tolerance:

“Most plants prefer a moist, well-drained soil. However, provided a plant is otherwise healthy, has had time to become established (normally one to two years after planting), and is provided appropriate cultural conditions (adequate soil drainage and aeration, mulch, moderate to low fertilization, proper pH, appropriate light level, etc.) those plants indicated as drought-tolerant should be able to survive a moderate period of limited moisture (rainfall, irrigation). Drought-tolerance does not mean the plants prefer hot, dry weather or that they will not be adversely affected by extended dry weather. High temperatures and wind, heat and light reflection from nearby hard surfaces, and high fertilization can increase the potentially damaging effects of low moisture on plant growth and survival. Fall-planted trees and shrubs have demonstrated an increased ability to survive moderate moisture levels compared to those transplanted in the spring or summer.” (From NCSU, “Drought-tolerant Shrubs,” December, 2003).

 **Water-Wise Tip:** The allowed plant tables display the water needs of each plant. This information can be utilized during the design process to group plants with similar water needs and achieve a landscape that is easy to maintain. Consider site characteristics such as soil drainage and nutrient-holding capacity, preferred sun exposure, and urban conditions when selecting plants.

B. Plant Material Quality Standards

1. Requirements

- a. Within sight distance triangles, plant material shall meet the requirements of UDO paragraph 12.3.1D.3, Design Standards.
- b. Per UDO paragraph 9.2.3A, Plant Materials, General, the physical characteristics of trees provided to meet Ordinance-required plantings shall be in accordance with the American Standard for Nursery Stock (most current edition). Some of these characteristics include:
 - 1) Plants used shall be nursery-grown (unless otherwise approved with the landscape plan), typical of their species or variety, with normal growth habit, well-developed branch structure, healthy foliage, and vigorous root systems. Plants should be free from defects, disfiguring knots, sunscald injuries, frost-cracks, abrasions of the bark, plant diseases, insect eggs, borers, fire ants, and all forms of infestation.

- 2) Balled-and-burlapped (B & B) plants shall include the earth in which the plant has been growing and have a diameter meeting the specifications in the American Standard for Nursery Stock.
 - 3) The burlap used to secure the ball shall be untreated and biodegradable.
 - 4) Plants showing evidence of congestive, strongly circling roots (indicative of future weak root growth and poor plant performance) shall not be accepted.
 - 5) Trees provided for street tree and parking applications should have straight trunks with an intact single central leader, unless the tree's natural form does not support a central leader (for example: most flowering trees or Japanese maples), or a multi-stem tree is specified.
 - 6) Trees which have had their branches shortened (sheared), leaders cut, or have damaged leaders which require cutting shall not be accepted.
 - 7) Plants of each particular variety shall be uniform in size, density, and configuration typical of the particular variety. Plants should have a fully developed form without voids and open spaces, consistent with age and species of the plant.
 - 8) Burlapped root balls shall be firm and undamaged from handling or shipping.
- c. Field-collected plants shall not be used to meet Ordinance-required landscaping unless they have been specifically identified on the approved landscape plan, and a qualified plant professional (see Section 4A) certifies the method and performance of their transplanting.
 - d. Plants used for Ordinance-required landscaping shall be provided as specified in the plant list on the approved landscape plan. If a discrepancy exists between the number of plants specified in the Plant List and the graphic representation on the plan, the installer should use the number graphically represented on the plan.

2. Recommendations

- a. For container-grown trees, use fingers or small hand tools to pull the roots out of the outer layer of potting soil; then cut or pull apart any roots circling the perimeter of the container.
- b. Prior to actual installation, plants used for Ordinance-required landscaping should be protected from sun and/or drying winds and extreme temperatures at all times. Plants that cannot be installed immediately upon delivery to the site should be kept in the shade or covered with burlap to prevent sun scorch.
- c. Plants which remain unplanted for longer than one day should be heeled in (i.e. covered with wet compost, soil, or other acceptable material) and their root ball kept moist by watering. Plants should not remain unplanted on site longer than three days, unless a temporary irrigation system is used.

C. Criteria for Determining Allowed Locations for Use of Ordinance-Required Plant Material

The following tables describe the typical criteria used by the Planning Director or designee to determine allowed locations for use of the trees and shrubs found in the plant tables at the end of this *Landscape Manual*. Some plants are allowed to serve more than one use (e.g. both as a canopy tree and as an understory tree) and are, therefore, located within more

than one table in the plant list. However, each site is unique and a designer should consider these criteria, along with the recommendations provided in the tables, when selecting plants for a particular project's landscape requirements.

1. Allowed Tree Table Category Criteria

Allowed Use/Location Category (Trees)	Typical Criteria for Specific Category of Use/ Location
Street Trees, Rural and Suburban (UDO Sec. 9.6, Street Trees)	Trees that need large areas (35 feet minimum) between the street and building(s), especially suitable for use in the Suburban and Rural Tiers (as required).
Street Trees, Urban (UDO Sec. 9.6, Street Trees)	Trees which are adaptable to poor soil conditions and restricted growth areas; tolerant of pollution and possible (road) salt conditions; and tolerant of reflected heat from pavement and building surfaces.
Street Trees, Downtown and Compact (UDO Sec. 9.6, Street Trees)	Trees which are adaptable to urban conditions and smaller planting areas between the street and building(s); especially suitable for use in engineered planting areas and restricted spaces having pavement encroaching on the growing area.
Street Trees, Under Power Lines (UDO Sec. 9.6.2A)	Street trees that meet the above criteria, and are approved by Duke Energy Progress.
Parks (Not required by the UDO)	Recommended canopy trees that typically need larger growth areas; or understory trees that tolerate shade and competition from canopy trees, or will be used as canopy trees in the Urban, Compact Neighborhood, or Downtown Tiers. Pollution- and heat-tolerance is preferred when used in urban parks.
Vehicle Use Areas (UDO Sec. 9.8, Vehicle Use Area Landscaping)	Trees which tolerate pollution, poor soils, tight growing conditions, and reflected heat and typically have branching starting at six to seven feet above finished grade. Trees that are multi-stemmed or full to the ground shall be planted where their mature size and shape will ensure required sight clearances are provided and maintained, or specified as limbed up to at least six feet above finished grade.
Tree Coverage Replacement Areas (UDO Sec. 8.3, Tree Protection and Tree Coverage)	"Replacement" trees that are typically either canopy trees which tolerate some shade and tighter spacing (except where larger areas and spaces are available), and/ or understory trees (usually deciduous) which tolerate shade competition from canopy trees.
Buffers, Constructed (UDO Sec. 9.4, Project Boundary Buffers)	Typically, trees native to the Durham area and generally suited to the growing conditions found within a constructed buffer; trees should be selected for each site based on adaptability to the unique site conditions. Non-invasive, non-native trees suited to the growing conditions within the proposed buffer can also be used.
Buffers, Solid Hedge (UDO Sec. 9.4, Project Boundary Buffers)	Evergreen understory trees which are dense and full to the ground, and capable of meeting Ordinance requirements.
Buffers, Riparian (UDO Sec. 8.5, Riparian Buffer Protection Standards)	Trees recommended by the North Carolina Ecosystem Enhancement Program (as specified in the Carolina Vegetation Survey Database) for stream buffer restoration plantings.

2. Allowed Shrub Table Category Criteria

Allowed Use/Location Category (Shrubs)	Typical Criteria for Specific Category of Use/ Location
Urban Conditions (UDO Paragraph 9.6.2C, Street Trees in the CI District and Design Districts)	Typically, shrubs adaptable to poor soil conditions and restricted growth areas; tolerant of pollution and possible (road) salt conditions; and tolerant of reflected heat from increased pavement and building surfaces. Other shrubs noted in the tables with an asterisk (*) can be used in urban conditions if it is demonstrated that growing conditions appropriate to the species proposed are provided.
Vehicle Use Areas (UDO Sec. 9.8, Vehicle Use Area Landscaping)	Shrubs that tolerate pollution, poor soils, reflected heat, and tight spaces. Recommended shrubs shall be planted where the mature shrub size and shape will allow required sight clearances to be provided and maintained.
Sight Distance Triangles (UDO paragraph 9.8.1C.6)	Shrubs less than 30 inches in height at maturity, or easily maintained at that height while also maintaining all of the natural characteristics of the plants' form, leaves, and structure. These shrubs can be planted where safe sight clearances within parking lots, and at driveway and street intersections, are required.
Under Tree Coverage (Shrubs are not required in tree coverage areas by the UDO. However, shrubs in this category can be planted under tree coverage to also meet other Ordinance-required landscaping, such as buffers.)	These species are adaptable to shade conditions and to competition with trees, and can be used in tree coverage areas that serve to fulfill multiple Ordinance requirements. Similar to Constructed Buffers, shrubs should be selected for each site based on adaptability to the unique site conditions.
Buffers, Constructed (UDO Sec. 9.4, Project Boundary Buffers)	Shrubs native to the North Carolina Piedmont region and generally suited to the growing conditions found within a constructed buffer; shrubs should be selected for each site based on adaptability to the unique site conditions. Non-invasive, non-native shrubs suited to the growing conditions within the proposed buffer can also be used.
Buffers, Solid Hedge (UDO Sec. 9.4, Project Boundary Buffers)	Evergreen, understory trees (or large evergreen shrubs with mature heights of at least eight feet) which are dense and full to the ground.
Buffers, Riparian (UDO Sec. 8.5, Riparian Buffer Protection Standards)	Shrubs recommended by the North Carolina Ecosystem Enhancement Program (as specified in the Carolina Vegetation Survey Database) for stream buffer restoration plantings.

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5. Successful Groundcover, Shrub, and Tree Installations

A. Site and Soil Preparation


1. Requirements

- a. For Ordinance-required tree planting, see **Figure 1, Required Tree Planting Detail**.
- b. Provide tree protection fencing (see **Figure 4, Required Tree Protection Fence Detail**) to protect any existing trees, shrubbery, and planting beds in the planting area.
- c. Create plant beds of the size and location shown on the approved site plan.

2. Recommended Practices

- a. To protect existing turf areas which are to remain after completion of the project, bridge-over traffic areas with sheets of plywood, and cover non-traffic areas with tarps. Turf protection should be removed immediately as work is completed or at the end of every work day, whichever is shorter.
- b. Where several plants will be spaced close together, they should be planted in one larger bed in order to allow for sharing of root space and amendment of all the soil in that bed. All groundcovers and container shrubs should be planted in a shrub bed (see **Figure 3, Recommended Shrub Planting Detail**). Balled and burlapped material, or large container material, can be planted in individual planting holes. The planting area should be wide enough to accommodate all roots without crowding, and contain nutrient-rich soil.
- c. Remove all vegetation and topsoil from the top three inches of the planting area for both planting beds and plant holes. Remove unwanted vegetation from the site, stockpile topsoil on site for future use or remove from site if specifically stated in the approved Site Plan.
- d. Dig all shrub beds two to three times the width of the root mass and all tree planting holes a minimum three times the width of the root ball in highly compacted or clay soils, or two times the width of the root ball in all other soils, with a minimum of nine inches on each side of the root mass or ball for shrubs and 12 inches for trees. Tree planting holes should be wider at the top with tapered sides. This can be accomplished by digging with a large auger to the required depth; and then breaking down the sides with a shovel to eliminate glazing, transferring the material to the low side of the slope and creating the preferred slope. The sides of the pit may be scarified if needed. Avoid creating smooth or “glazed” sides of the pit. The bottom of the hole should be flat and firm to prevent settling; do not dig or scarify.
- e. For street trees proposed to be planted within a street right-of-way, see **Figure 2, Tree Planting within Right of Way Detail**, for recommended planting practices if no planting detail is provided on the approved Landscape Plan. Contact the City’s Urban Forester for more details on procedures for planting trees within City street rights-of-way when applicable. Contact the City Transportation Department or NCDOT, as appropriate, about requirements for encroachment agreements.

- f. After digging plant holes, confirm positive drainage by filling with water and allowing it to percolate out before setting trees and shrubs. If drainage is a problem, lower the depth of the planting hole and provide an alternative drainage system.
- g. Install a sufficient quantity of planting mix to replace the removed topsoil and to achieve positive drainage at a minimum of 1.5% slope. The replacement soil should be the following planting mix for most plants: 10% - 30% sterile well-pulverized red clay, 30% - 50% silt, 30% - 45% coarse sand, 1.0 mm to 0.5 mm in diameter, minimum 5% organic material such as completely decomposed compost/humus. The acidity range of the plant mix should be pH5.5 to pH7.0. The planting mix should have the following nutrients at the specified percent base saturation: calcium at 55% to 80%, magnesium at 10% to 30%, and potassium at 5% to 8%.
- h. If native soil is to be used in lieu of replacement planting mix, remove any clay lumps, roots, or other foreign matter. Test the soil to determine what nutrients may be needed and in what amounts. Amend with organic matter (typically 5% by volume), lime and fertilizer according to the soil test, at the rates specified on the packages or in accordance with **Section 5C, Fertilizing and Liming Shrubs and Trees**.


 **Water-Wise Tip:** Knowledge of soil drainage and nutrient holding capacity is vital to maximize the effectiveness of water in the landscape.

B. Plant Installation

1. **Requirement:** Plants installed to meet Ordinance requirements shall be alive and healthy at site inspection. They shall remain alive and healthy, and actively growing and thriving during the life of the development. Trees shall be planted according to **Figure 1, Required Tree Planting Detail**. Dead or missing plants will result in UDO violations, requiring replacement of the dead and missing plant materials.
2. **Recommended Practices**
 - a. Soak all container plants with water before removing them from their containers to keep the plant moist and healthy during the planting process.
 - b. Remove groundcover and shrubbery from their containers. If their root balls are pot-bound, scarify the ball before installation.
 - c. Set plants upright, plumb, and oriented to provide the best appearance and relationship to the viewer, each other or adjacent structure.
 - d. Set trees and shrubs two to three inches above finished grade. Do not place backfill soil on top of the root ball, or up the stems or trunks of plant material. Use large equipment as needed to properly set trees in pits. Do not bend the trunk or use the trunk as a lever to move the tree ball in the pit. This practice can lead to damaging the root system, which can result in a dead plant.
 - e. Backfill around the root ball of container plants, being careful not to pack tightly but filling in all air pockets. Do not use muddy or frozen mixtures for backfilling. Form a two inch high collar of soil around the drip zone of the individual shrub in all areas not irrigated.
 - f. Take extra care to adequately backfill B & B plants. Backfill and compact the bottom third of the root ball. Cut away the ball ties, the top two thirds of the wire basket,

and the exposed burlap. Do not remove the burlap from under the root ball. Backfill one half of the remaining hole with the specified planting mix and water thoroughly. Backfill the rest of the hole with the specified planting mix; firm down to eliminate air pockets, but do not pack tightly. Build a collar of soil four inches in height around the edge of the root ball to form a basin for holding water. Form the bottom of the basin at the surrounding finish grade.

- g. Mulch with two to three inches of mulch (composted hardwood mulch is recommended). See **Section 5F, Mulching Trees and Shrubs**, for additional details on mulching, especially provisions and City Code limitations on the use of pine straw as mulch.
- h. The use of landscape fabric is not recommended. It has been shown to inhibit air, water, and nutrient movement to the soil and roots, resulting in poorly performing plantings. It has also been demonstrated that weed growth is only marginally diminished for one season at most.
- i. Water all plants immediately after planting. See **Section 5D, Watering Shrubs and Trees**, for more on watering.


 **Water-Wise Tip:** New plantings should be watered deeply and thoroughly with a low pressure water-dispersing device within the drip line of the plant.

- j. Wrapping tree trunks is not recommended. Instead, trees should be marked in the nursery with the side facing north and oriented the same in the planting hole to avoid sun scald.

C. Fertilizing and Liming Shrubs and Trees

1. *Recommended Practices*


- a. First determine the soil texture and infiltration rate. Addition of pine bark humus (<1/2" diameter), fully composted leaf mold, or small pea gravel to clay soils, at a minimum of 25% and a maximum of 50% by volume, will help improve drainage. This will increase supply of both water and oxygen to the plants. Peat moss, sand, hardwood bark, sawdust, wood chips, or pine straw are not recommended as amendments to clay soils. Addition of these amendments can also help to raise the bed, which will both improve drainage and look more attractive. Pine bark humus, composted leaf mold, or peat moss will improve water retention in sandy soils if added at a minimum of 25% and a maximum of 50% by volume.
- b. Test the soil to determine which nutrients are needed and their quantities; and if an adjustment is needed in the soil pH. Without a soils test, application of fertilizer could be detrimental to the landscape. Over-application or application of unneeded materials is not cost-effective, can result in salt injury to plants and nutrient imbalances unsuitable for plant growth, and is environmentally unsound.

 **Water-Wise Tip:** Over-fertilization can also lead to increased nutrient discharge into the groundwater and surface runoff.

- c. Nitrogen, phosphorous, and potassium are the main nutrients tested. Calcium or magnesium may also be needed, if indicated by the soil test. Adding too much calcium will inhibit the absorption of potassium and magnesium, and many sources

of calcium raise soil pH. If calcium is low, but a pH change is undesirable, gypsum can be incorporated into the soil prior to planting according to package directions.

- d. Fertilizers should be of a slow-release variety. It is better to apply them more often during the growing season than to apply once for the entire year, since plants will not be able to absorb all the nutrients, which is not cost-effective.

 **Water-Wise Tip:** Withhold fertilization during times of drought. Nutrient application stimulates growth and increases water needs.


- e. After determining what soil amendments (fertilizer, lime, etc.) are needed, incorporate them uniformly in the top six to eight inches of the native soil using a rototiller prior to planting. If replacement soil is used, amendments should be mixed into that soil prior to filling around plant materials.
- f. Where several trees or shrubs will be planted together in the same planting bed, soil amendments should be spread uniformly over the entire bed.
- g. Where individual plants are installed, apply granulated fertilizer as a top dressing within the drip line of each individual plant. Immediately remove any fertilizer that comes in contact with the stem, trunk, or foliage of a plant. Work the fertilizer into the top two inches of the soil before installing mulch.
- h. Lime, or other amendment to change the pH, should be added according to the landscape specifications or as needed per the soil test.
- i. Be careful to sweep up any stray nutrients that might otherwise be washed into stormwater inlets, to avoid pollution. Washing them off hard surfaces without collecting them flushes the debris into the storm system, and eventually into the riparian system and water-supply lakes. Be careful when applying nutrients around water bodies, and do not to add nutrients directly into any body of water.

D. Watering Shrubs and Trees

2. Recommended Practices

- a. Be sure water is free from oil, acids, salts, or any other substances that are toxic or harmful to vegetation.
- b. Water container plants thoroughly before removing from their containers to keep the plants moist and healthy during the planting process.
- c. Water all plants immediately after planting. To water thoroughly, saturate all backfill in beds during the same day of planting. Apply water at low pressure to avoid soil erosion, breaking the soil collars that surround each plant, and/or injury to roots. Use of a water-dispersal device such as a watering wand is recommended to enable efficient and even water application to all parts of the root ball. Make sure plants are level and the top of the root ball does not sink below existing grade once they are watered and fully settled.
- d. Thoroughly soak the tree root ball and adjacent prepared soil several times during the first month after planting and regularly throughout the following two summers.
- e. Individual watering bags may be used, especially when trees are planted in the warmer months. These watering bags need to be maintained, checked for leaks,

kept full, and removed when damaged or no longer needed. The use of anti-desiccant is discouraged.

 **Water-Wise Tip:** Avoid overwatering and check frequently for areas of poor soil drainage. Too much water is often more detrimental to trees and shrubs than too little.

E. Irrigation (as Applicable)

It is not a requirement to have an automated irrigation system to maintain Ordinance-required plantings.

Requirements (per City Code or State Statute) for Installation

1. Any automated irrigation system must be installed per regulations provided under North Carolina General Statute 89G.
2. The City of Durham regulates water usage in accordance with the Code of Ordinances, City of Durham, North Carolina (Durham City Code), Sections 70-554 and 70-555.
3. The City of Durham under varying drought conditions can enact water shortage response requirements that restrict the amount and frequency of water usage in accordance with Durham City Code Section 70-566.


F. Mulching Shrubs and Trees

1. Requirements (per City Code)

Use of pine straw mulch shall conform to the requirements established in Chapter 46, Public Safety; Article III, Fire Prevention and Protection, Division 2, Fire Prevention Code; and Section 46-87, Use of Pine Straw Mulch, of the Durham City Code.

2. Recommended Practices

- a. Shredded, composted hardwood (triple or double cut) is preferred as mulch. The mulch should not contain any trash or weed seeds. Pine straw may be used around plants that prefer high acidity and where a less formal finish is desired, such as in natural areas, when specified on the approved landscape plan, subject to Fire Prevention Code restrictions.
- b. Pine bark nuggets and unshredded mulches float and can wash away easily, and are, therefore, not recommended. Uncomposted mulches rob nutrients from the soil surrounding the plant as they decompose or may “burn” young plants.
- c. Stone mulches may compact and decrease moisture to new plantings while reflecting heat, and should be limited to unique site conditions where other mulches cannot be used and these conditions will be tolerated.
- d. Apply mulch in a two to three inch layer within two days of planting. The use of landscape fabric is not recommended.
- e. It is recommended that mulch not be applied closer than six inches to the trunk of a tree or against the main stems of shrubs. After watering, rake mulch to provide a uniform, finished surface.

 **Water-Wise Tip:** Mulching regulates soil temperature, decreases soil water loss from the root ball, and lessens weed growth. Weed control is important because weeds

compete with trees and shrubs for moisture. Weed control fabric is not recommended because it can slow down water, air, and nutrient absorption into the root ball.

G. Staking Trees

Recommended Practices

1. Staking for support is generally not recommended for large (2- 1/2 inch caliper to six inch caliper) B & B trees if the tree is planted using the methods described in this *Landscape Manual*. However, because the trunks are exposed, it may be necessary to place three stakes around the tree at the edge of the root ball for protection of the trunk of the tree. Use stakes that are tall enough to be seen easily. When using stakes for protection, do not attach wire or rope to the trees.
2. Do not stake trees less than two inch caliper and shrubs less than eight feet in height unless they were planted as bare-root specimens.
3. Under unusual conditions (such as high winds, steep slopes, etc.), staking may be desirable to stabilize the tree. It is recommended that the installer discuss proposed staking with the Planning Site Compliance Inspector. In these cases, it is recommended to stake the trees using two 1" x 2" x 18" minimum size wood stakes on opposing sides of the tree, perpendicular to the prevailing wind direction. Drive anchors into undisturbed soil and never through the root ball. Loosely loop individual, flexible straps, or rope fed through sections of rubber hose, around the trunk to prevent damage to the bark. Do not tie strapping or hose directly onto the tree trunk.
4. The stakes should offer support, but also not bind or bend the tree, because flexibility of the trunk is essential for its future growth and development. Generally, after the first growing season the tree will be able to support itself and stakes should be removed.

H. Pruning Techniques for Trees

Recommended Practices

At the time of installation, no pruning should be necessary except to remove branches damaged in the course of transport and installation. The following is recommended for trees that have reached the end of their warranty establishment period:

1. Remove water sprouts.
2. Remove crossing branches which rub against other branches. The rubbing weakens the growth of both branches.
3. Remove branches which grow at a sharp angle to the trunk. The sharp angle is a weak angle of attachment and may cause a weakened limb to split from the trunk, or cause rot by giving water a place to collect.
4. Remove parallel branches (those branches which attach to the trunk one above the other within inches up the trunk).
5. For street and parking lot trees, prune out the lower limbs of the tree to increase the height of the crown while respecting the form of the tree and keeping within the 2/3 crown to 1/3 trunk ratio. Repeat as necessary over time to reach the required six foot minimum clear areas in sight-distance triangles, or the 80-inches minimum recommended clear area for trees in pedestrian access areas, or the 13-foot clear areas recommended over roadways or vehicular access areas.

6. Remove any branch competing with the central leader (single-stemmed trees only). If left on the tree it may cause the development of two leaders, and waste available growth energy. Later, as each leader gets larger, the fork may split and damage the tree.
7. Remove any dead or broken branches.
8. Pruning should be performed in compliance with *ANSI Standards for Tree Care Operations: Tree Shrub and Other Plant Maintenance – Standards Practices (Pruning)*.
9. It is recommended to avoid improper pruning practices (which are any pruning techniques which cause injury, reduce health and vigor, and/or increase risk of future failure) such as the following:
 - a. For deciduous trees, improper practices include, for example:
 - 1) “Topping,” which is the removal of the central leader or the shortening of branch ends through the application of inter-nodal cuts;
 - 2) “Vista pruning,” which is the arbitrary removal of limbs to open the view over or under a tree’s canopy; and
 - 3) “Shearing,” which is the reduction of a tree’s overall profile to a pre-determined shape;
 - b. For deciduous shrubs: the removal of more than a third of healthy growth;
 - c. For evergreen trees and shrubs: the removal of more than a third of growth;
 - d. For all trees and shrubs: the use of tools that leave uneven or broken cuts or wounds;
 - e. The use of climbing spikes, irons, or gaffs is discouraged (and not permitted on City-owned trees), unless the tree is being removed.

I. Turf

1. Requirements

- a. Tall fescues, including Kentucky 31™, are not allowed for use in Ordinance-required re-vegetation of disturbed stream buffer and floodplain areas, and in areas draining into streams or wetlands, due to their invasive nature under wet growing conditions. See **Table 4, Plants Not Allowed for Ordinance-Required Plantings**.
- b. A seeding schedule for re-vegetating areas in floodplains and stream buffers disturbed during utility, stormwater facility, and road construction activities shall be provided on site plan landscape and utility sheets. The schedule shall include, at a minimum, the scientific and common names of the plants being installed, the type of plant material (seed, sprigs, plugs, sod, or other), the appropriate season during which the material can be successfully applied, and the rate (amount per area) of plant material to be planted.

2. Recommended Practices

- a. See **Section 5J, Native Grasses**, below, for information about planting native grasses in lieu of tall fescues.

- b. Winter cover crops are often specified if the prime season for planting of permanent grasses has not arrived when turf must be planted. Winter rye grain (not ryegrass) and barley are recommended for this use.
- c. At the time of turf installation, fine-grade the surface relatively smooth and with a maximum of one foot vertical to three feet horizontal difference in elevation.
- d. Incorporate lime and fertilizer, in accordance with soil tests and the rates specified on the package, in the top six to eight inches of the soil using a rototiller, being careful to sweep up any nutrients that land outside lawn areas on pavement or other surfaces that drain to water bodies or stormwater inlets.
- e. Remove all rocks larger than one-half inch in size and other debris.
- f. Use a rake to create a smooth and level bed, free of hollows and depressions, and soil particles no larger than pea size.
- g. Water to settle the soil, and rake again to break the crusty surface before seeding.
- h. Seed can be applied with asphalt tack. If not applied with asphalt tack, weed-free straw or other erosion control measure should be applied to the seeded area within hours after seeding, and before any heavy rains or high winds.
- i. Take precautions to keep vehicle and foot traffic off of seeded areas until after the first mowing.
- j. For sod installation, the following practices are recommended:
 - 1) Spread four inches of topsoil and cultivate entire area to a depth of four to six inches.
 - 2) Spread lime and fertilizer over cultivated topsoil (as per specifications on package and the results of soil testing) and hand rake to a smooth finish grade. As with seeding, be careful to sweep up any lime or fertilizer landing on pavement or other surfaces that drain to water bodies or stormwater inlets to minimize pollution.
 - 3) Thoroughly water area to be sodded prior to installation.
 - 4) Lay sod, roll, and water thoroughly.

💧 **Water-Wise Tip:** Utilization of warm season turf grass varieties in appropriate locations can decrease watering. In the design phase, avoid small areas of turf grass, such as parking lot islands, which have excessive water requirements and can be difficult to maintain.

💧 **Water-Wise Tip:** Water during pre-dawn hours for optimal moisture absorption and disease control, but avoid over-saturation which can lead to excessive surface runoff. Avoid over-fertilization, especially in times of drought.

J. Native Grasses

Recommended Practices

1. Designers are encouraged to use native grasses (in lieu of tall fescues) on the outside of stream buffer strips, where stream buffers are disturbed (e.g. for road or utility crossings), and in any areas that drain to wetlands or streams.

2. Establishment of native grasses requires proper timing and bed preparation. Often a cover crop of barley or other non-invasive temporary legumes or grasses is used until the spring planting season. The following native grasses can be used in place of tall fescue (all are warm season grasses and perennial). Most have fall color, are drought-tolerant, persist through the winter, and only need cutting once a year in the spring:
 - a. *Andropogon gerardii* – Big Bluestem – clumping, not tolerant of wet soils, taller than little bluestem. Use 10-12 pounds of pure live seed (about double bulk seed). Seed from April 15-May 30. Recommended soil pH is between 5.4 and 6.2.
 - b. *Panicum virgatum* – Switchgrass – useful in both wet and dry areas, good for erosion control and re-vegetation of large areas, but does poorly on heavy soils. Need to completely eradicate competing grasses and weeds for best survival. Some available varieties include 'Blackwell,' 'Heavy Metal,' 'Alamo,' 'Kanlow,' and 'Shelter.' These grasses perform best with a soil pH of around 5.0. These grasses can be drill-seeded on large acreage, and can be broadcast on smaller plots at 5-10 pounds/acre depending upon the seed (live or bulk). A rate of 10 pounds/acre conventional planting (live seed) is recommended; eight pounds/acre drilled. Do not use nitrogen at seeding time, because it will stimulate weed growth. Phosphorus and potassium should be applied according to soil tests before or at seeding.
 - c. *Pennisetum glaucum* – Brown Top or Pearl Millet – fast-growing, robust, annual grass with good drought-tolerance. Good for warm season soil stabilization.
 - d. *Schizachyrium scoparium* – Little Bluestem – clumping, not tolerant of wet soils. Use 10-12 pounds of pure live seed per acre (about double bulk seed). Seed from April 15-May 30. Recommended soil pH is between 5.4 and 6.2.
 - e. *Tridens flavus* – Purple-Top – dry areas best. Seed in the springtime. Use 10-15 pounds of pure live seed per acre for drill seeding. Broadcast seeding should be 20-25 pounds of pure live seed per acre.
 - f. *Sorghastrum nutans* – Indian Grass – rhizomatous, perennial, native, warm-season bunchgrass. Best in deep, well-drained floodplain soils, but tolerant of poor condition from sand to clay. Plant after last threat of frost, but before heat of summer (late April and May). Broadcast 10 pounds of pure live seed per acre (or drill 6-8 pounds/acre), pack after seeding. Best in moist but firm seedbed. Hold off nitrogen until after well-established; pH-adaptable.
 - g. *Chasmanthium latifolium* – Inland Sea Oats, Indian Woodoats, Wild Oats – rhizomatous, clump-forming, perennial. Found in light to partial shade, on moist to well-drained sites; not dry sites. Establish via plugs or divisions.
3. Annual winter cover, if needed, should be planted in early to late fall at the rate of 50-60 pounds/acre if drilled, or 60-100 pounds/acre broadcast. Winter rye or rye grain (not rye grass) (*Secale cereale*, *S. cereale* *abruesses*, *S. cereale* 'Winter Grazer 70') or barley (*Hordeum vulgare*, *H. jubatum*, *H. murinum*, or *H. pusillum*) are recommended until ground is warm enough to plant with permanent cover.

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6. Glossary

Allelopathic	Suppression of growth of one plant species by another due to the release of toxic substances.
Annuals	Flowering plants used to provide seasonal color and interest. Their root stock dies in winter, therefore annuals need replanting each growing season. Annuals are often referred to as “bedding plants.”
Asphalt Tack	A slurry of nutrients, seeds, and asphalt that is used to apply grass seed, with the purpose of efficiently-distributing seed and mulch in a single application.
B & B	Abbreviation for “balled and burlapped” plants, as sold by a nursery. See UDO Section 16.2, Abbreviations.
Caliper	See UDO Section 16.3, Defined Terms, for definition and specifications.
Canopy	The branched portion of a tree or forest.
Canopy Cleaning	A recommended pruning technique involving the removal of dead and/or broken limbs of canopy trees in order to reduce potential risks.
Canopy Reduction	A recommended pruning technique involving the removal of carefully selected limbs back to appropriate lateral junctions to reduce the size of a tree’s canopy.
Canopy Restoration	A recommended pruning technique involving the removal of all or a portion of damaged, weakly-attached, or structurally-compromised limbs, while leaving appropriate, healthy, lateral junctions to restore a tree’s canopy after it has been subjected to storm damage or improper pruning.
Central Leader	A primary or terminal shoot, i.e., the trunk of a tree.
Chlorosis or Chlorotic	A condition in which a plant’s leaves do not produce sufficient chlorophyll, resulting in pale, yellow, or yellow-white leaves; usually caused by a combination of factors including lack of vital nutrients or unsuitable growing conditions for the species. ¹
City Tree	Any tree living on property owned or maintained by the City of Durham, including those in City-managed rights-of-way.
Common Name	A non-scientific plant name used commonly by the citizens of a given region or country. ¹ The same plant may have many different common names. A trademark name, either registered (®) or unregistered (™), is often used as a plant’s common name. The common names used in this <i>Landscape Manual</i> are typical for each plant, but may not include all local common names for a specific plant.

- Cultivar**.....A cultivated variety¹ of a plant species. See “Scientific (Latin) Name” for more detail on how these are usually listed.
- Cut**.....Exposed wood area that remains after a branch has been removed.
- dbh**.....Diameter-at-breast-height. See UDO Section 16.3, Defined Terms.
- Deciduous**.....Plants that annually lose their leaves; literally “falling off¹”.
- Deciduous Canopy Tree**.....See UDO paragraph 9.2.2, Basic Plant Types, for definition and specifications. See **Tables 1A and 1B** of this *Landscape Manual*.
- Deciduous Understory Tree**.....See UDO paragraph 9.2.2, Basic Plant Types, for definition and specifications. See **Tables 1E and 1F** of this *Landscape Manual*.
- Dormant**.....A condition of non-active plant growth. Deciduous trees and shrubs are considered to be dormant from the time their leaves fall until new foliage begins to reappear.
- Ecosystem**.....A complex or community of organisms and its environment.
- Evergreen**.....Plants that retain green or live foliage throughout the year.
- Evergreen Canopy Tree**.....See UDO paragraph 9.2.2, Basic Plant Types, for definition and specifications. See **Tables 1C and 1D** of this *Landscape Manual*.
- Evergreen Understory Tree**.....See UDO paragraph 9.2.2, Basic Plant Types, for definition and specifications. See **Tables 1G and 1H** of this *Landscape Manual*.
- Exotic**.....For this *Landscape Manual*, plants that are not generally considered native, or naturalized, to Durham or the Piedmont region of North Carolina.
- Fastigate (Form)**.....Branches erect and close together¹; narrow and upright.
- Friable Soil**.....Soil that is capable of sustaining plant growth by virtue of its pH, relative rate of compaction, organic content, particle size, positive drainage characteristics, and pore space distribution. “Native” undisturbed soils generally fall under this description; developed, disturbed, or degraded sites where topsoil has been removed generally require remediation to attain this designation. See **Section 5C, Fertilizing and Liming Trees and Shrubs**, of this *Landscape Manual* for further definition and specifications.
- Ground Cover**.....See UDO Section 16.3, Defined Terms, for definition and specifications.
- Herbaceous**.....Plants that die back to the ground each winter.
- Height, Plant**.....Height for all plants is measured from the ground level at the base of the plant to the average height of the top branches of the plant, and not to the longest or tallest branch. For plants in containers, plant height does not include the height of the container.

Invasive Plant	A non-native species whose introduction does, or is likely to, cause economic or environmental harm, or harm to human health. Unless otherwise indicated, cultivars of invasive plants are also considered to be invasive.
Landscape Plan	Typically a component of a site plan or preliminary plat, a landscape plan shows types, species, names, numbers, sizes, and locations of materials to be planted or preserved. See also UDO Section 3.7.
Limb-Up or Lift Up	Removal of lower branches for under-clearance, typically to allow for free passage of pedestrians and vehicles, or to improve sight distance. This procedure can also be used to change a large shrub into a tree-form plant.
Native	With respect to a particular ecosystem, a species that historically occurred or currently occurs in that ecosystem, rather than a species introduced more recently into that ecosystem. For the purposes of this <i>Landscape Manual</i> , native trees in Tables 1A through 1H, Allowed Trees , are those that are generally considered native (or naturalized) to Durham County. Native shrubs in Tables 2A through 2D, Allowed Shrubs , are generally considered native (or naturalized) to the Piedmont region of North Carolina. Cultivars and clones of a native species, unless crossed with non-native species, are also considered to be native for the purpose of this <i>Landscape Manual</i> .
Ornamental Grasses	Herbaceous plants, which may be perennial or annual. They are typically used to provide color/textural interest. Ornamental grasses are not allowed for credit in Ordinance-required plantings.
Perennials	Flowering herbaceous plants whose root stock survives the winter. They are typically used to provide color/textural interest. Perennials are not allowed for credit in Ordinance-required plantings.
Pruning	Removal of branches from live trees or shrubs for a specific purpose.
Riparian	Related to, or living or located along, the bank of a surface watercourse, such as a stream or river.
Root Protection Zone (RPZ)	See UDO paragraph 8.3.2, Tree Protection and Tree Coverage, and Section 16.3, Defined Terms, for dimensional standards and definition.
Sample Area	See UDO paragraph 9.3.3, Sampling, for definition and requirements; and Figure 5, Sample Area Example , for one graphic representation example of the required information.

- Scars (or Injuries)**.....Natural or man-made lesions of the bark¹ in which wood is exposed.
- Scientific (Latin) Name**An accepted, international method of scientifically naming plants for horticultural and botanical plant classification. The Latinized scientific name is called the “species” and consists of two parts: the plant genus and the specific identifier¹ (e.g. *Acer rubrum*, or *A. rubrum* if already listed as an *Acer*). In this example, *Acer* identifies the plant as belong to the Maple genus. The second name often indicates an identifying characteristic. In this case *rubrum* means “red” so it is easily recognized as a Red Maple (the tree’s common name), although that is not always the case. Botanical variety (var.), subspecies (subsp.), forma (f.), cultivar (‘Cultivar Name’) and hybrids (x) are listed as needed to differentiate between specific plants. Trademark names may be registered (®) or unregistered (™), and the trademarked plant is often also known by its cultivar name.
- Semi-Evergreen**Plants that usually retain green or live foliage through mild winters, but may lose their foliage during colder ones.
- Shrubs**See UDO paragraph 9.2.2, Basic Plant Types, for definitions and specifications. See **Tables 2A through 2D, Allowed Shrubs**, of this *Landscape Manual*.
- Species**A group of organisms, all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms.¹
- Specimen Tree**See UDO paragraph 8.3.5, Specimen Trees, and Section 16.3, Defined Terms, for dimensional requirements and definition.
- Stolon**.....A horizontal branch from the base of a plant that produces new plants from buds at its tip or nodes (as in the strawberry or bamboo) —also called a runner.²
- Stoloniferous**Bearing or developing stolons² as a means of spreading and propagation.
- Suckering**Sending out shoots from the base of a plant² as a means of spreading to form colonies of the plant.
- Variegated**Leaves that are striped, margined, or mottled with a color other than green, where green is normal.¹
- Water Sprouts**Vertical sprouts or shoots which grow up through the middle of the tree or shrub, usually from the base.¹

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Weeping (Form).....A conspicuously drooping, pendant¹ form, usually of a tree or shrub.

¹ After Dirr, Michael A. *Manual of Woody Landscape Plants, Their Identification, Ornamental Characteristics, Culture, Propagation and Uses*, Sixth Edition. Champaign, IL: Stipes Publishing Company, Revised 2009.

² The Merriam-Webster Unabridged Dictionary, <http://www.merriam-webster.com/dictionary/>.

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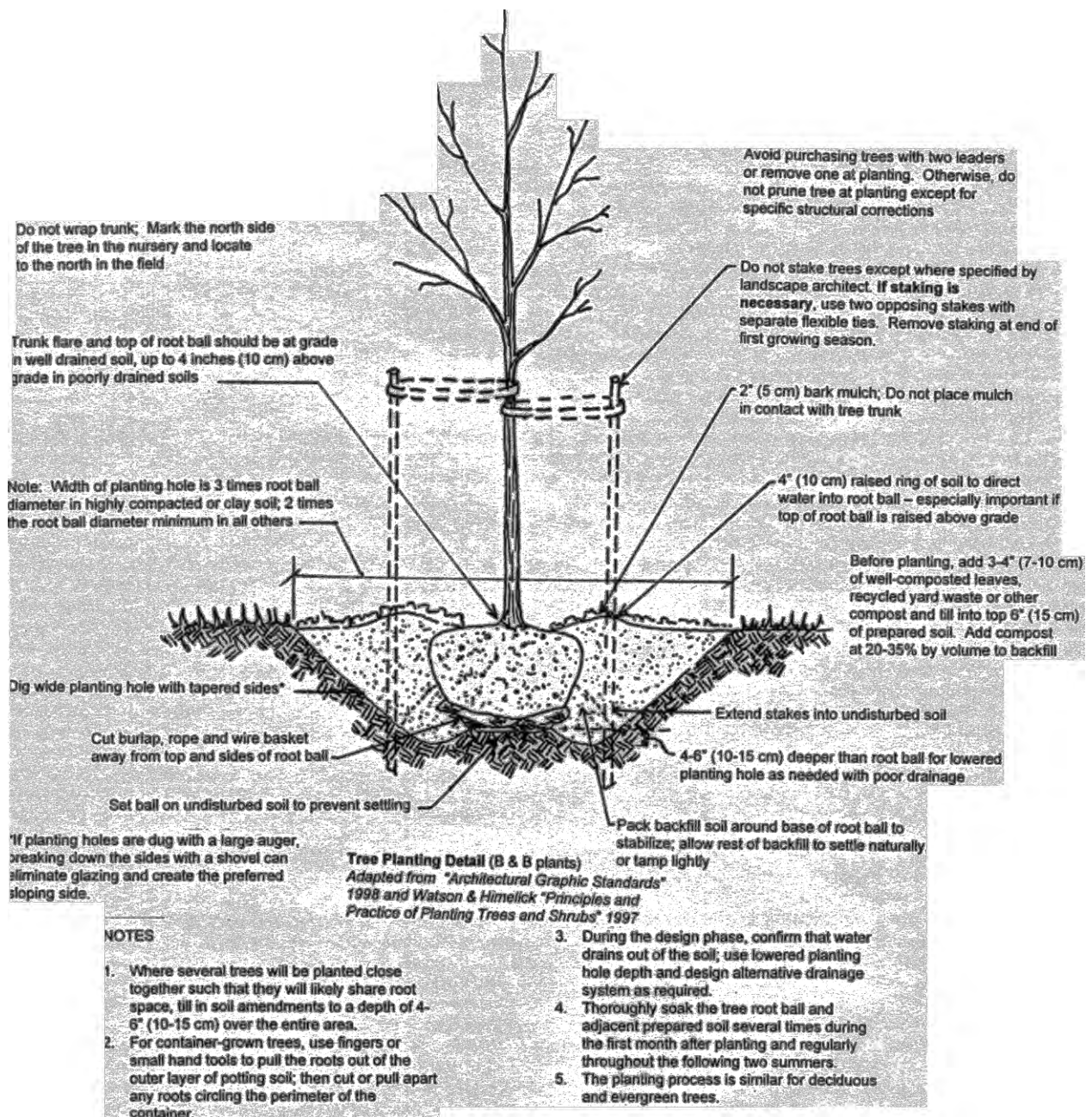
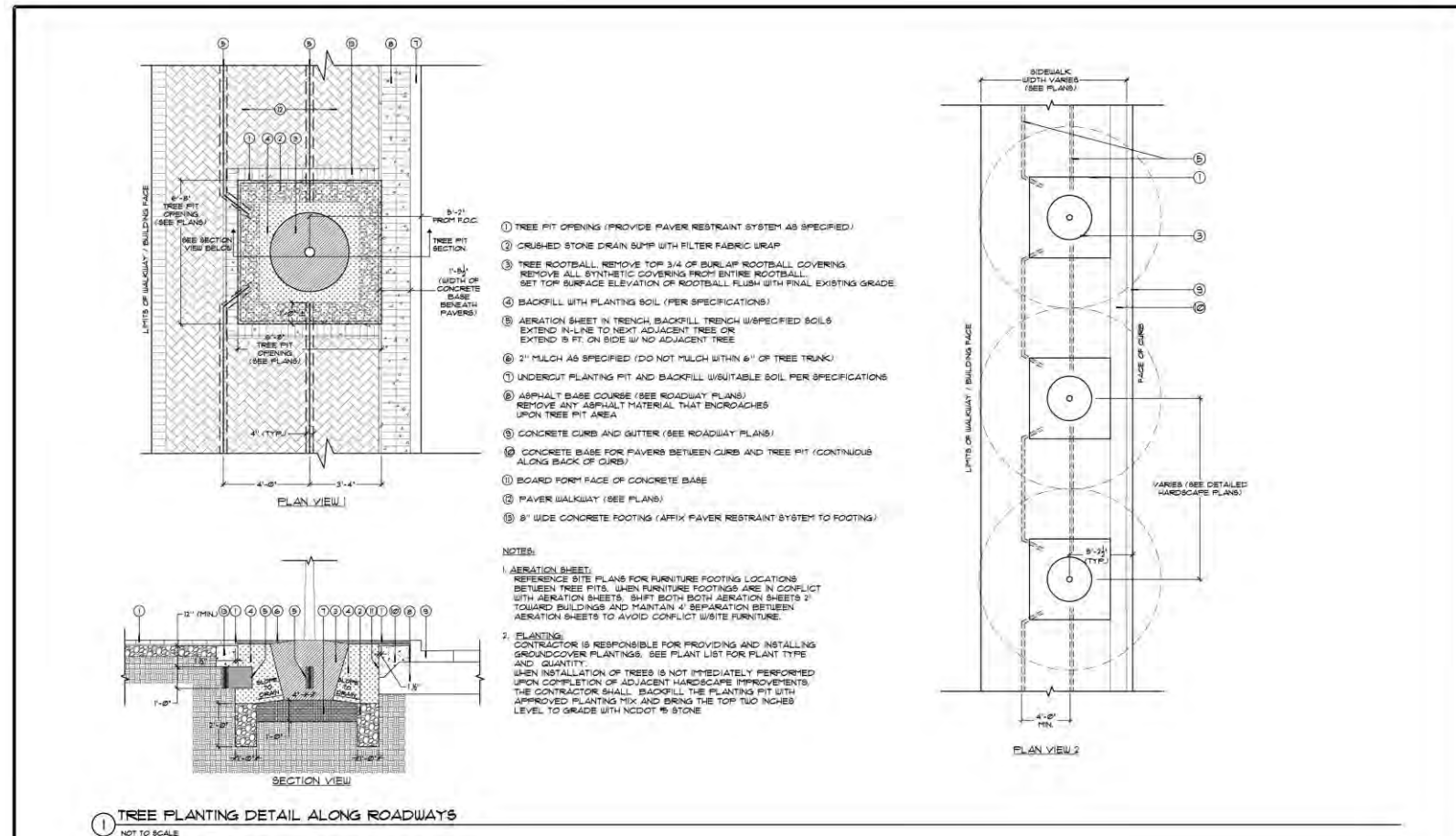
Figure 1, Required Tree Planting Detail

Figure 2, Recommended Tree Planting Within Right of Way Detail

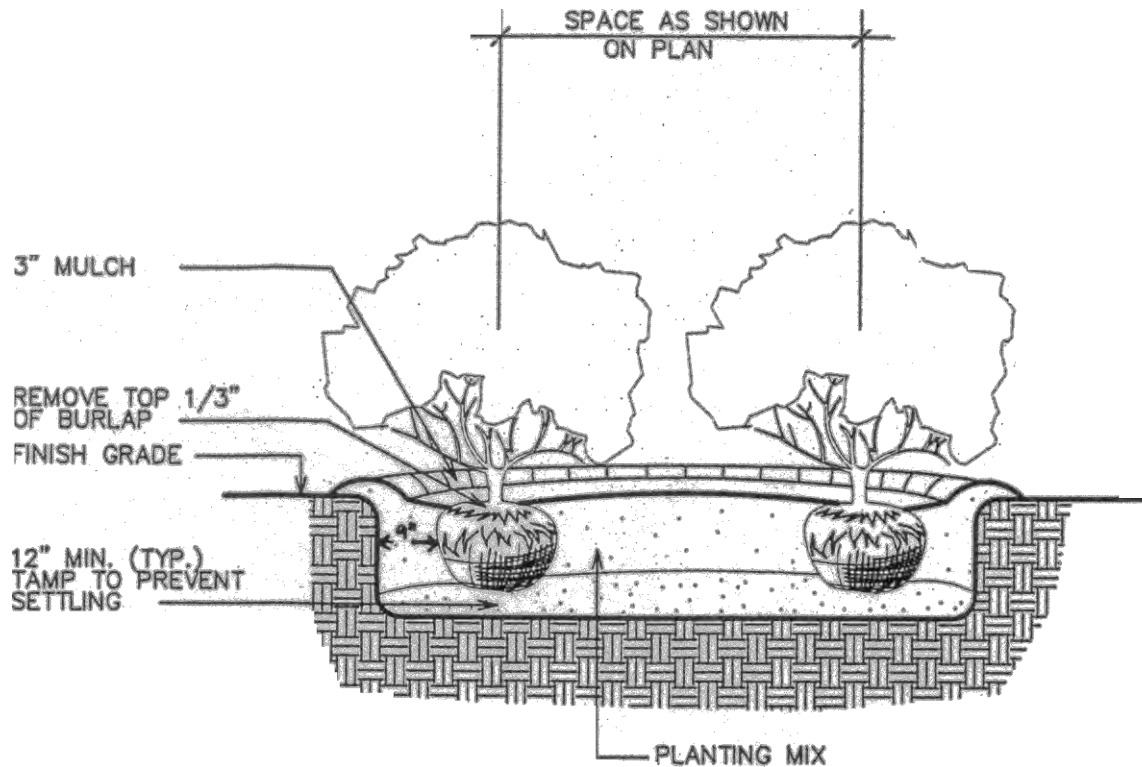
(See Sec. 2.3.3, Planting Details, of the *Durham Design Manual*)



PREPARED FOR CITY OF DURHAM DEPARTMENT OF PUBLIC WORKS / ENGINEERING 101 CITY HALL PLAZA DURHAM, NC 27701 PHONE: (919) 560-4325 FAX: (919) 560-4316	PROJECT NO. DATE BY	<h2 style="margin: 0;">DOWNTOWN STREET IMPROVEMENTS PHASE II</h2> <h3 style="margin: 0;">CORCORAN AND PARRISH STREET IMPROVEMENTS</h3> <h2 style="margin: 0;">LANDSCAPE / HARDSCAPE PLAN</h2> <h3 style="margin: 0;">STREETSCAPE DETAILS</h3>	SEAL DATE: _____ DESIGNED BY: WCC DRAWN BY: MGD CHECKED BY: NTS JUN 2006	 Kimley-Horn and Associates, Inc. P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27668 PHONE: (919) 677-2000 FAX: (919) 677-7000 PRODUCT NO: 011494015 SHEET NO: LD2 OF 10
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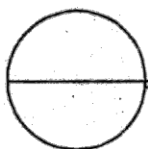
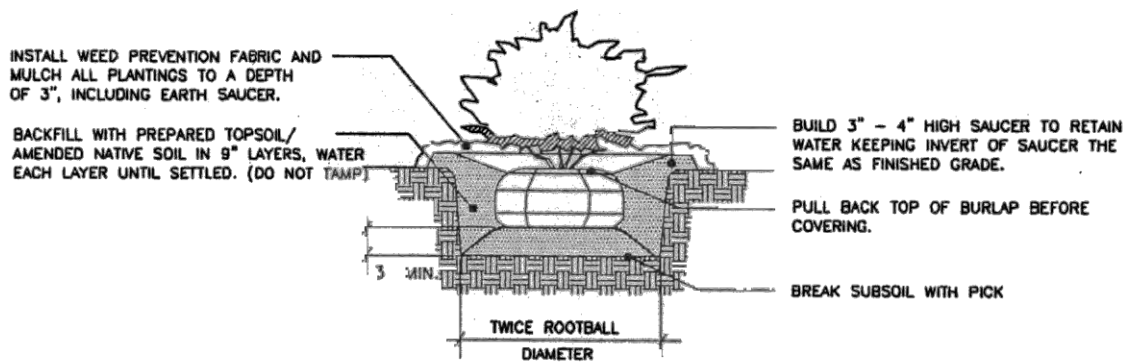
Figure 3, Recommended Shrub Planting Detail

(See the *Durham Design Manual* for Design District Details)



SHRUB/GROUND COVER PLANTING DETAIL

NOT TO SCALE



SPECIMEN SHRUB PLANTING DETAIL

NO SCALE

Figure 4, Required Tree Protection Fence Detail

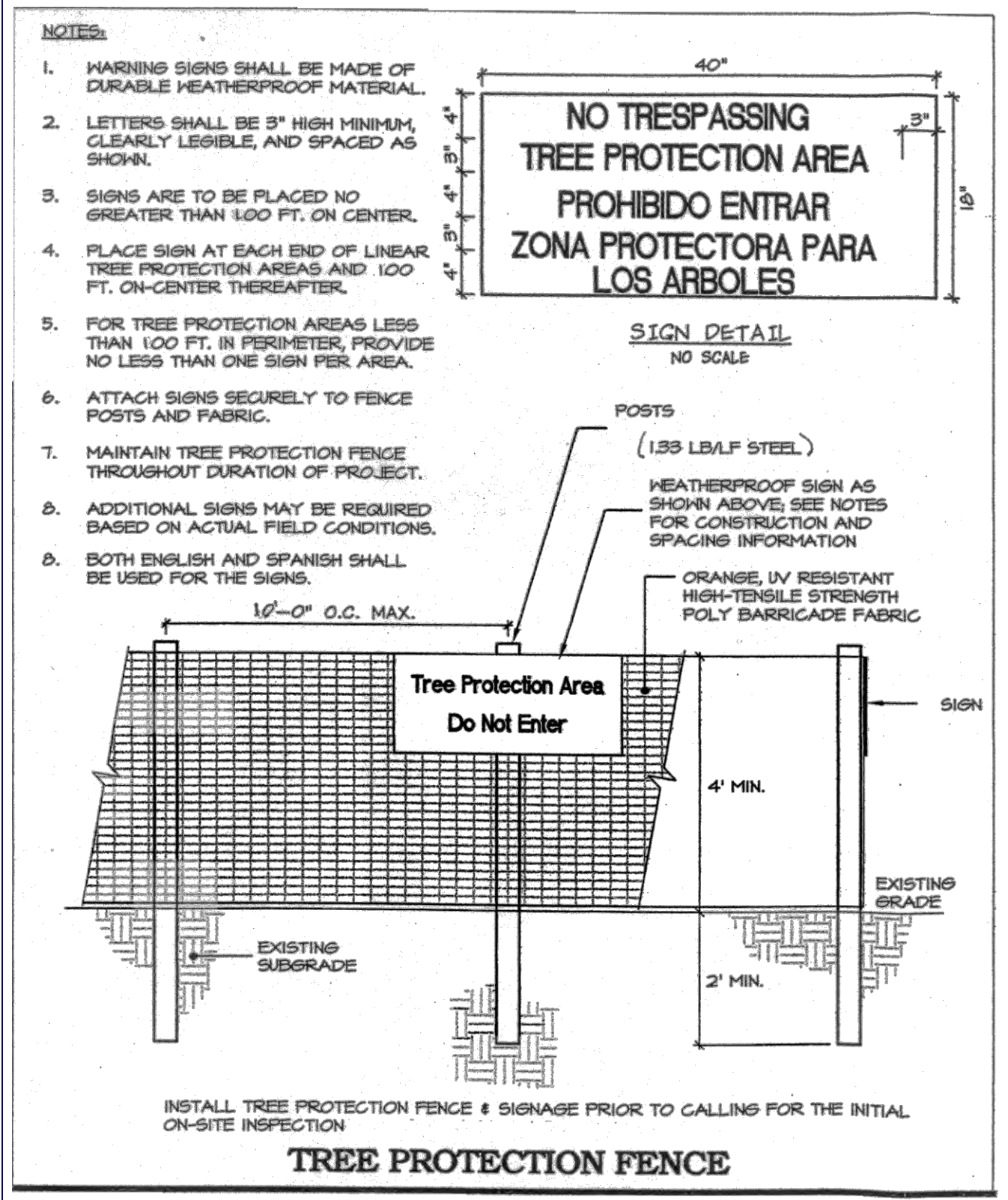
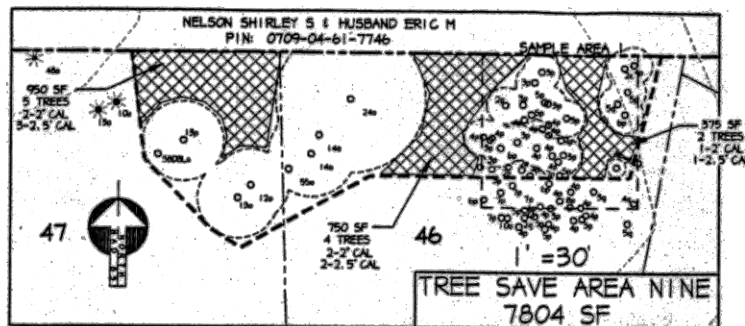
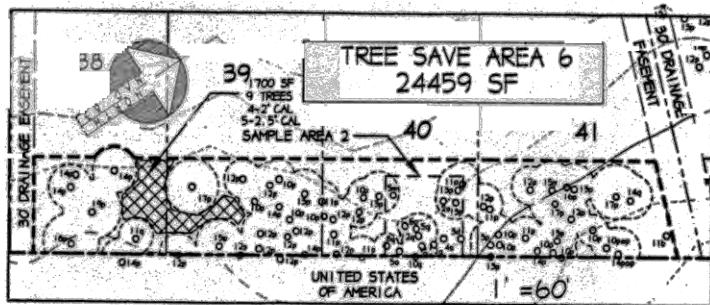


Figure 5, Sample Area Example



AREA #	SAVE ROOT ZONE AREA	REPLANTING ADDITIONAL TREES				AREA CREDIT	TOTAL AREA SF	MINIMUM DIMENSION
		2" CAL #	175 SF	2.5" CAL #	200 SF			
1	96230 SF	41	7175	41	8200	15375 SF	111605 SF	25 LF
2	15127 SF	0	0	0	0	0 SF	15127 SF	25 LF
3	57879 SF	27	4725	28	5600	10325 SF	68204 SF	25 LF
4	6131 SF	8	1400	8	1600	3000 SF	9131 SF	25 LF
5	17000 SF	14	2450	14	2800	5250 SF	22250 SF	25 LF
6	22759 SF	4	700	5	1000	1700 SF	24459 SF	25 LF
7	10675 SF	13	2275	14	2800	5075 SF	15748 SF	25 LF
8	6863 SF	0	0	0	0	0 SF	6863 SF	25 LF
9	5729 SF	5	875	6	1200	2075 SF	7804 SF	25 LF
TOTAL	238391 SF	112	19600	116	23200	42600 SF	281191 SF	

SAMPLING AREAS														
AREA 1			AREA2			AREA 3			AREA 4			AREA 5		
SIZE	TYPE	QTY	SIZE	TYPE	QTY	SIZE	TYPE	QTY	SIZE	TYPE	QTY	SIZE	TYPE	QTY
2"	PINE	3	13"	PINE	3	5"	PINE	2	2"	PINE	12	2"	PINE	1
3"	PINE	12	12"	PINE	1	8"	PINE	2	5"	PINE	20	4"	PINE	1
4"	PINE	18	11"	PINE	1	9"	PINE	1	4"	PINE	1	5"	PINE	2
5"	PINE	7	10"	PINE	1	10"	PINE	1	3"	GUM	5	6"	PINE	1
6"	PINE	4	2"	OK	1	11"	PINE	3	4"	GUM	1	7"	PINE	3
7"	PINE	6	4"	OK	1	12"	PINE	2	2"	HAWLE	1	8"	PINE	1
8"	PINE	1	5"	OK	2	13"	PINE	1	3"	HAWLE	1	10"	PINE	2
2"	CEDAR	1	2"	SHEET GUM	2	14"	PINE	1	4"	HAWLE	1	11"	PINE	2
3"	CEDAR	1	5"	SHEET GUM	1	15"	PINE	2				13"	PINE	1
10"	OK	1	8"	SHEET GUM	1	16"	PINE	1				14"	PINE	3
2"	GUM	1	10"	SHEET GUM	1	18"	PINE	1				16"	PINE	1
3"	GUM	1	12"	SHEET GUM	1	5"	OK	1				2"	OK	4
4"	GUM	1	5"	HAWLE	1	4"	OK	1				3"	OK	6
5"	GUM	2				20"	OK	1				4"	OK	2
						2"	ASH	2				5"	OK	4
						3"	ASH	5				6"	OK	1
						4"	ASH	2				8"	OK	1
						5"	ASH	1				2"	HAWLE	2
						2"	SHEET GUM	2				3"	HAWLE	2
						3"	SHEET GUM	11				4"	HAWLE	2
						4"	SHEET GUM	3				4"	GUM	1
						5"	DOH422D	1				5"	GUM	1
												6"	GUM	1

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Figure 6, Plant Table Key





Heading	Code and Meaning
Requirements:	
Required Minimum Root Area (Trees): Requires the surface area listed in the table, and two feet average depth of friable soil throughout planting area or equivalent volume in engineered root pathways, soil vaults, or Silva Cells™. (TM = DeepRoot Green Infrastructure, LLC)	1 = 150 square feet 2 = 250 square feet 3 = 350 square feet
Allowed Location of Use Categories: Specific locations/purposes where Ordinance-required plantings can be used for credit. “Urban Locations,” as used in the shrub tables, refers to paragraph 9.6.2C, Street Trees in the CI District and Design Districts. Exceptions: “Allowed” tree locations for “Parks” are Recommended . The “Allowed” shrub location, “Under Tree Coverage,” is not required, but indicates the plant’s suitability for use in those locations	Y = Approved for the listed Location of Use Category. Y* = Approved for the listed Location of Use category, if demonstrated that the recommended cultural conditions are provided. Blank = Not approved for the Location of Use Category.
Suggested Cultural Information:	
Suggested Established Plant Wet / Dry & Soil Tolerance: All new plantings require regular watering to establish. Shrubs are generally established after one year. Trees establish at an average rate of one year per caliper inch equivalent installed.	1 Performs best in moist, well-drained soil. Intolerant of drought and poor drainage often caused by flood conditions, compaction, and heavy clays. 2 Performs best in moist, moderately drained soils. Will not tolerate drought. Can withstand brief periods of poor drainage. 3 Performs best in very moist soils. Well-suited to poorly drained, compacted, and heavy clay soils. 4 Performs best in moderate moisture and well-drained sites. Can withstand brief dry periods. Intolerant of prolonged drought or flood conditions. 5 Performs best in moderate moisture. Intolerant of prolonged drought. Can tolerate brief periods of poor drainage. 6 Performs best in moderate moisture, but very adaptable to poorly-drained sites and flood conditions. 7  Waterwise species. Performs best in minimal moisture. Will tolerate prolonged drought. Requires well-drained soils. Not suited to heavy clays, compacted soils, or flood conditions. 8  Waterwise species. Can tolerate prolonged drought. Somewhat adaptable to poorly-drained sites, compacted soils, and heavy clays. Will not withstand prolonged flood conditions. 9  Waterwise species. Performs best in moist, poorly-drained soils. Adaptable to compacted soils, heavy clays, and flood conditions.

Figure 6, Plant Table Key (continued)

Heading	Code and Meaning
Suggested Cultural Information (Continued):	
Suggested Sun Exposure: Preferred amount of sun exposure for best performance of plants.	FS = Full Sun (At least 6 full hours of direct sun each day) PS = Part Sun / Shade (3-6 hours of direct sun each day) SH = Shade (Less than 3 hours of direct sun each day, and filtered sunlight during the rest of the day)
Suggested pH Range: Indicates adaptability over a range of soil pH and, especially, plants that perform best in a specific pH range.	Below 5.5 = Strongly Acidic 5.5 – 6.2 = Acidic (Sour) 6.2 – 6.8 = Neutral 6.8 – 7.4 = Basic (Sweet) Above 7.4 = Strongly Basic

Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham

Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer barbatum</i>	Southern Sugar Maple	3	Y	Y	Y		Y	Y	Y	Y			FS PS	5.0-7.0	7 	50 x 50 rounded	Heat-tolerant, native sugar maple, good fall color
<i>Acer rubrum</i>	Red Maple	3	Y	Y			Y		Y	Y		Y	FS SH	5.0-7.0	6	50 x 50, rounded	Pyramidal crown in youth; thin bark susceptible to heat scorch; planting in poor soils will produce a shallow root system: not for Downtown, due to scale
<i>Acer rubrum</i> Burgundy Belle® ('Magnificent Magenta')	Red Maple (smaller cultivars)	3	Y	Y			Y		Y	Y			FS SH	5.0-7.0	6	25-35 x 35, round	Compact, round cultivars
<i>Acer rubrum</i> Northwood®, 'October Brilliance', Red Sunset® ('Franksred'), Redpointe®, 'Somerset', 'Sun Valley'	Red Maple (medium cultivars)	3	Y	Y			Y		Y	Y			FS SH	5.0-7.0	6	40-50 x 30-40, oval	Medium-maturing varieties with mature oval form (pyramidal in youth)

¹ Allowed Location of Use Categories: Y = Allowed;

Y* = Allowed if demonstrated conditions provided;

Blank = Not approved for required landscaping in category listed



² Required Minimum Root Area (Trees): 1 = 150sf; 2 = 250sf; 3 = 350sf³ Sun Exposure: FS = Full Sun PS = Part Sun / Shade FS = Full Shade⁴ pH Range: 4.0 - 6.2 (Acid); 6.2 - 6.8 (Neutral); 6.8 - 9.0 (Basic)⁵ Wet/Dry and Soil Tolerance - see Figure 6, Plant Table Key, on page 37;Options 7, 8, and 9 are designated as a  (Waterwise) species

Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer rubrum</i> ‘Bowhall’, ‘Brandywine’, ‘Columnare’, ‘Karpick’, ‘Scanlon’	Red Maple (medium, fastigate cultivars)	3	Y	Y			Y		Y	Y			FS SH	5.0-7.0	6	50 x 20, conical to columnar	Medium-maturing varieties with conical or conical form
<i>Acer rubrum</i> Autumn Flame®, October Glory®, Oktoberfest®, ‘Schlesingeri’, ‘Shade King’	Red Maple (large, oval cultivars)	3	Y				Y		Y	Y			FS SH	5.0-7.0	6	55 x 50, oval	Pyramidal crown in youth, mature to oval form
<i>Acer saccharum</i>	Sugar Maple	3	Y				Y		Y	Y			PS SH	5.0-7.0	4	50 x 40, oval	Pyramidal in youth
<i>Acer saccharum</i> Green Mountain® or Legacy®	Sugar Maple cultivars	3	Y	Y	Y		Y		Y	Y			PS SH	5.0-7.0	5	50 x 30, oval	Selected for urban sites and heat-tolerance
<i>Acer saccharum</i> subsp. <i>leucoderme</i>	Chalk Maple	1				Y	Y		Y	Y		Y	FS PS	5.5-7.0	7 	25-30 x 15-30, oval, rounded	Fall color comparable to <i>Acer saccharum</i> ; not a canopy tree in Rural/Suburban Tiers
<i>Aesculus flava</i>	Yellow Buckeye	3					Y		Y	Y			PS SH	5.0-7.0	1	45 x 50, round	Native to mountains; fruit and leaf scorch may be problematic
<i>Betula nigra</i>	River Birch	2							Y	Y		Y	FS PS	4.0-6.0	5	40 x 30, oval, round	Multi-stemmed or single, branches droop; “messy” tree

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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Betula nigra</i> Dura-Heat® ('BNMTF'), or Heritage® ('Cully')	River Birch (cultivars)	2	Y	Y			Y	Y	Y	Y		Y	FS PS	5.0-6.0	5	40 x 25, oval, round	Less prone to leaf spot and aphids; Dura-Heat® is smaller than species; “messy”
<i>Carpinus caroliniana</i>	American Hornbeam	1		Y	Y	Y	Y	Y	Y	Y			FS SH	4.0-7.0	5	20-30 x 20-30, oval, round	Slow-growing; if used in Urban, Downtown, or Compact Neighborhood Tiers, provide some winter sun and wind protection and good drainage; somewhat difficult to transplant; should be B & B; a canopy tree except in Rural/Suburban Tiers
<i>Carya cordiformis</i>	Bitternut Hickory	3					Y		Y	Y			FS PS	6.5-7.4	8💧	60 x 30, oval	Large tap root requires deep soil; fruit not compatible with cars & pedestrians
<i>Carya glabra</i>	Pignut Hickory	3					Y		Y	Y		Y	FS PS	6.5-7.4	8💧	50 x 30, oval	Same as above
<i>Carya ovata</i>	Shagbark Hickory	3					Y		Y	Y			FS PS	4.0-6.7	4	60 x 35, oval	Same as above
<i>Carya illinoensis</i>	Pecan	3					Y		Y	Y			FS PS	5.0-7.3	5	80 x 55, upright	Same as above; leaves and nut husks stain pavement; “messy”
<i>Celtis laevigata</i>	Sugar Hackberry	3	Y	Y			Y	Y	Y	Y		Y	FS PS	4.8-6.8	5	50 x 50, rounded	“Bushy” in youth; heat and drought-tolerant

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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Celtis occidentalis</i>	Common Hackberry	3	Y	Y			Y	Y	Y	Y		Y	FS PS	6.0-7.8	8💧	40 x 40, round	“Bushy” in youth; cultivars recommended
<i>Cercis canadensis</i> and ‘Flame’, ‘Forest Pansy’, ‘Rubye Atkinson’	Eastern Redbud (species and cultivars)	1				Y	Y		Y	Y			PS SH	4.5-7.5	5	20-30 x 25-30, round, spreading	‘Forest Pansy’ cultivar valued for purple foliage; not a canopy tree in Rural/Suburban Tiers
<i>Cladrastis kentukea</i> (formerly <i>C. leutea</i>)	Yellowwood	3	Y				Y		Y	Y			PS	4.8-6.5	4	35 x 40, round, spreading	White flowers
<i>Cornus florida</i> and ‘Cloud 9’, ‘White Cloud’, ‘Rubra’, var. <i>rubra</i> ‘Cherokee Chief’	Flowering Dogwood (species and cultivars)	1				Y*	Y		Y	Y		Y	PS SH	5.0-7.0	4	20-30 x 20-30, broad, spreading	Cultivars more disease-resistant than species; ‘Rubra’ and ‘Cherokee Chief’ have pink flowers, others white; not a canopy tree in Rural/Suburban Tiers
<i>Diospyros virginiana</i>	Persimmon	2	Y	Y	Y		Y	Y	Y	Y			FS SH	5.0-7.0	5	35 x 25, irregular, oval	Fruit, leaf spot and caterpillars; male trees preferred in urban areas; use males for street trees
<i>Fagus grandiflora</i>	American Beech	3					Y		Y	Y		Y	PS SH	4.1-6.5	7💧	50 x 40, oval	Very sensitive to soil conditions
<i>Fraxinus pennsylvanica</i>	Green Ash	3					Y		Y	Y		Y	FS PS SH	5.0-8.0	5	50 x 50, round	Pyramidal in youth; borers and fruit are problematic

¹ Allowed Location of Use Categories: Y = Allowed;

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
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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements											Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵			
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian						
<i>Fraxinus pennsylvanica</i> ‘Oconee’	Georgia Gem® Green Ash	3	Y	Y			Y	Y	Y	Y			FS PS SH	5.0-8.0	5	60 x 50, round	This is the only cultivar selected from southern stock; leaves larger than other ashes	
<i>Fraxinus profunda</i>	Pumpkin Ash	3					Y		Y	Y		Y	FS PS SH	4.5-5.9	6	70 x 50, round	Prefers moist sites; some diseases	
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree	3	Y	Y			Y		Y	Y			FS PS	6.0-8.0	5	60 x 60, round	Needs deep soil profile and alkaline soils; fruitless varieties available	
<i>Liquidambar styraciflua</i>	Sweetgum	3							Y	Y		Y	FS PS	4.5-7.0	4	50 x 50, round	Fruit considered a nuisance; not suitable for urban areas due to fruit, brittle branches, and size	
<i>Liquidambar styraciflua</i> ‘Rotundiloba’	Sweetgum (fruitless cultivar)	3	Y	Y			Y	Y		Y			FS PS	4.5-7.0	4	50 x 50, round	Brittle wood; can revert to fruiting; poor nursery tree, and not as recommended as it once was	
<i>Liquidambar styraciflua</i> ‘Slender Silhouette’	Sweetgum columnar cultivar	2	Y	Y	Y		Y	Y	Y	Y			FS PS	4.5-7.0	4	50 x 15, narrowly columnar	Narrow crown for tight spots; has fruit	
<i>Liriodendron tulipifera</i>	Tulip Poplar	3					Y		Y	Y		Y	FS PS	4.5-6.5	4	70 x 35, pyramidal	Best in areas where space is not limited	
<i>Liriodendron tulipifera</i> ‘fastigiatum’ (‘Arnold’)	Columnar Tulip Poplar	3	Y	Y	Y		Y			Y			FS PS	4.5-6.5	4	60 x 20, columnar	Wood is brittle; handle carefully at time of planting	

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Options 7, 8, and 9 are designated as a ♠ (Waterwise) species

Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Nyssa sylvatica</i>	Black Gum	2	Y	Y			Y		Y	Y			FS PS SH	4.5-6.0	5	50 x 40, pyramidal	Named cultivars available with improved branch structure and rooting potential; some heat and drought-tolerance
<i>Nyssa sylvatica</i> var. <i>biflora</i>	Swamp Tupelo	3					Y		Y	Y		Y	FS	4.5-5.7	3	40-50 x 25, pyramidal	Prefers wetter sites and acid soils
<i>Ostrya virginiana</i>	American Hophornbeam, Ironwood	2		Y	Y	Y	Y	Y	Y	Y		Y	FS PS	4.2-7.6	8💧	25-40 x 20-30, pyramidal, becoming rounded with age	Not commonly available, but has good tolerance of urban conditions
<i>Platanus occidentalis</i>	Sycamore, American-Planetree	3										Y*	FS PS	5.5-7.5	3	70-90 x 60-80, large, wide-spreading, irregular	Massively-large tree of bottom lands and moist, deep soils; <i>Anthraxnose</i> severely limits use; see <i>P. xacerifolia</i> in Table 1B
<i>Quercus alba</i>	White Oak	3	Y				Y		Y	Y		Y	FS PS	4.5-6.8	4	60 x 50, round	Taproot makes it difficult to transplant
<i>Quercus bicolor</i>	Swamp White Oak	3	Y	Y			Y	Y	Y	Y		Y	FS PS	4.3-6.5	6	50 x 50, round	Well adapted to urban sites
<i>Quercus coccinea</i>	Scarlet Oak	3	Y				Y	Y	Y	Y		Y	FS	4.5-6.9	4	60 x 50, round	No cultivars available

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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements											Recommended Cultural Information				
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Quercus falcata</i>	Southern Red Oak, Spanish Oak	3	Y	Y			Y	Y	Y	Y			FS PS	4.8-7.0	8💧	60 x 50, round	Difficult to obtain and transplant
<i>Quercus falcata</i> var. <i>pagodifolia</i>	Cherrybark Oak	3	Y	Y			Y	Y	Y	Y			FS PS	4.5-6.0	4	60 x 50, round	Preferred to species
<i>Quercus laurifolia</i> (<i>Q. imbricaria</i> , <i>Q. darlingtonia</i> , <i>Q. hemisphaerica</i>)	Laurel Oak	3	Y	Y			Y	Y	Y	Y		Y	FS PS SH	4.2-6.0	5	50 x 40, round	Leaves persist into winter (semi-evergreen); hybridizes naturally
<i>Quercus lyrata</i>	Overcup Oak	3	Y	Y			Y	Y	Y	Y		Y	FS PS	4.5-6.0	3	50 x 40, round	Well adapted to urban sites; named cultivars available
<i>Quercus lyrata</i> ‘QLFTB’	Highbeam® Overcup Oak	3	Y	Y			Y	Y	Y	Y			FS PS	4.5-6.0	3	45 x 35, oval	More upright and uniform than seedling
<i>Quercus marilandica</i>	Blackjack Oak	3					Y		Y	Y		Y	FS	4.8-5.8	7💧	50 x 50, round	Has problems with untreatable decay
<i>Quercus michauxii</i>	Swamp Chestnut Oak	3	Y				Y	Y	Y	Y		Y	FS	4.5-6.5	8💧	60 x 60, irregularly dense, rounded	Similar to Chestnut Oak; needs space
<i>Quercus montana</i> (formerly <i>Q. prinus</i>)	Chestnut Oak	3	Y	Y			Y	Y	Y	Y		Y	FS PS	4.5-6.0	7💧	60 x 60, irregularly dense, rounded	Usually found on dry, upland sites, in rocky, poor soil, but best growth in low, rich, moist sites; needs space

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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements											Recommended Cultural Information				
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Quercus nigra</i>	Water Oak	3					Y		Y			Y	FS	4.8-5.8	8💧	50 x 50, round	Has problems with untreatable decay; don't use as street tree or in parking lots
<i>Quercus phellos</i>	Willow Oak	3					Y	Y	Y	Y		Y	FS	4.5-5.5	5	60 x 50, oval, round	Species has variable form and character; street trees planted in 1930's are now dying out
<i>Quercus phellos</i> 'QPSTA'	Hightower® Willow Oak	3	Y	Y		Y	Y	Y	Y			Y	FS	4.5-5.5	5	50 x 30, oval	More uniform and upright than species
<i>Quercus phellos</i> 'QPMTF'	Wynstar® Willow Oak	3	Y	Y		Y	Y	Y	Y			Y	FS	4.5-5.5	5	50 x 30, oval	More uniform and upright than species
<i>Quercus shumardii</i>	Shumard Oak	3	Y				Y	Y	Y	Y		Y	FS	5.8-7.6	7💧	50 x 50, round	Needs well-drained soil
<i>Quercus shumardii</i> 'QSFTC'	Panache® Shumard Oak	3	Y	Y			Y	Y	Y	Y		Y	FS	5.8-7.6	7💧	50 x 50, round	More uniform and upright than species
<i>Quercus stellata</i>	Post Oak	3	Y	Y	Y		Y	Y	Y	Y		Y	FS	4.8-7.0	8💧	40 X 35, round, oval	Well-adapted to urban sites; typically found on dry, gravelly or sandy sites; seldom found in landscape situations
<i>Quercus velutina</i>	Black Oak	3							Y	Y			FS PS	4.5-6.0	6	45 x 45, round	Taproot makes it difficult to transplant; existing, healthy trees can be used in other locations if protected

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
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Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees							Buffers							
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Taxodium ascendens</i> (see <i>T. distichum</i> var. <i>imbricarium</i>)	Pondcypress																
<i>Taxodium distichum</i>	Baldcypress	3	Y	Y			Y	Y	Y	Y		Y	FS	4.5-6.0	6	70 x 30, conical	“Knees” form near water; taproot makes it difficult to transplant; needs space; deciduous conifer; wet and dry sites ok
<i>Taxodium distichum</i> ‘Sofine’	Autumn Gold™ Baldcypress	3	Y	Y	Y		Y	Y	Y	Y		Y	FS PS	4.5-6.0	6	70 x 30, upright, pyramidal	Notable autumn color; same notes as species
<i>Taxodium distichum</i> ‘Michelson’	Shawnee Brave™ Baldcypress	3	Y	Y	Y		Y	Y	Y	Y		Y	FS PS	4.5-6.0	6	70 x 20, conical	More columnar than species; sage green foliage
<i>Taxodium distichum</i> var. <i>imbricarium</i> (formerly <i>T. ascendens</i>)	Pondcypress or Pond Baldcypress	3	Y	Y			Y	Y	Y	Y		Y	FS PS	5.2-7.2	3	60 x 25, conical	Similar to <i>T. distichum</i> , but more compact; taproot makes it difficult to transplant; “knees” form next to water
<i>Tilia americana</i> species or <i>T. caroliniana</i>	American Linden, Basswood	3	Y				Y		Y	Y			FS PS SH	4.5-7.5	4	70 x 50, pyramidal	Not to be confused with <i>T. cordata</i> (Littleleaf Linden)

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Options 7, 8, and 9 are designated as a ♠ (Waterwise) species

Table 1A: Allowed Trees, Deciduous Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees							Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ulmus americana</i> ‘Princeton’	‘Princeton’ American Elm	3	Y	Y			Y	Y	Y	Y		Y	FS PS SH	5.5-8.0	5	70 x 70, vase-shaped	Plant named cultivars with resistance to Dutch Elm Disease only, such as ‘Princeton’, although some have been infected

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham

Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
			Street Trees							Buffers							
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer buergerianum</i>	Trident Maple	2	Y	Y		Y	Y	Y	Y			FS PS	5.6-6.5	7💧	30-40 x 25-35, oval, round	More compact than red or sugar maples; widely adapted to tough conditions; slow growing; later, red/orange fall color; peeling bark	
<i>Acer buergerianum</i> ‘ABMTF’	Aeryn® Trident Maple	2		Y	Y	Y		Y	Y	Y		FS	5.6-6.5	7💧	35-40 x 25-30, global	Uniform canopy; lustrous dark green leaves; yellow-red fall color	
<i>Acer buergerianum</i> ‘ABTIR’	Street Wise® Trident Maple	1	Y	Y	Y	Y	Y	Y	Y	Y		FS PS	5.6-6.5	7💧	30 x 20, upright oval	More regular and upright than species; reddish-purple fall foliage; has problems with cold injury and production has slowed	
<i>Acer campestre</i>	Hedge Maple	1	Y	Y	Y	Y	Y	Y	Y	Y		FS PS	5.6-8.5	8💧	35 x 30, round	Hardy smaller maple; species is variable; can be found as multi-stemmed tree	
<i>Acer campestre</i> ‘Evelyn’	Queen Elizabeth™ Hedge Maple	1	Y	Y	Y	Y	Y	Y	Y	Y		FS PS	5.6-7.8	8💧	35 x 30, global	Rounded with a flat top; dense canopy; more abundant fruit than species	
<i>Acer campestre</i> ‘Panacek’	Metro Gold® Hedge Maple	1	Y	Y	Y	Y	Y	Y	Y	Y		FS PS	5.6-8.5	8💧	35 x 20, upright oval	Upright, tight growth habit without the abundant fruit of Queen Elizabeth™ or species; bright yellow fall color	

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer xfreemanii</i>	Freeman Maple	3	Y				Y		Y	Y			FS PS	5.1-6.0	6	Variable	Hybrid of red and silver maples; fast growing with nice fall color; susceptible to insects and disease; cultivars preferred
<i>Acer xfreemanii</i> Scarlet Sentinel® ('Scarsen')	Freeman Maple (columnar cultivars)	3	Y	Y	Y		Y		Y	Y			FS PS	5.1-6.0	6	60 x 15, upright, columnar	Upright columnar varieties
<i>Acer xfreemanii</i> Autumn Blaze®, Autumn Fantasy®	Freeman Maple (oval cultivars)	3	Y	Y			Y		Y	Y			FS PS	5.1-6.0	6	50 x 40, oval, rounded	Oval/rounded varieties; ascending branch structure
<i>Acer griseum</i>	Paperbark Maple	2				Y	Y			Y			FS	6.1-7.5	8💧	30 x 15, upright, oval	Upright, narrow
<i>Acer leucoderme</i>	Chalkbark or Whitebark Maple	2				Y			Y	Y			FS PS	5.1-7.8	8💧	30 x 20, oval	Often multi-stemmed
<i>Acer palmatum</i>	Japanese Maple	1				Y	Y						FS PS	6.1-7.5	7💧	30 x 40, vase	Often a specimen; many cultivars are shorter--those over 20 feet can be used as canopy trees, except in Rural/Suburban Tiers

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



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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements											Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵			
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian						
<i>Acer truncatum</i>	Shantung Maple	1		Y	Y	Y	Y	Y	Y	Y			FS PS	5.5-7.4	7 	20-25 x 20, small, rounded, dense	A tough, heat- and drought-tolerant small Maple; not a canopy tree in Rural/Suburban Tiers	
<i>Betula lenta</i>	Sweet Birch	2					Y		Y			Y	FS PS	5.5-6.8	7 	40-55 x 30-40, pyramidal when young, rounded as ages	Native from Maine to Alabama, in the cooler mountains in the south; best performance in cool climates; best in moist, deep, rich soils, but tolerates poor, dry, rocky soils and clay; a NC DENR stormwater BMP Manual tree	
<i>Carpinus betulus</i> ‘Columnaris’, ‘Fastigiata’ (‘Pyramidalis’), ‘Frans Fontaine’	European Hornbeam (cultivars)	2	Y	Y	Y		Y	Y	Y	Y			FS PS	6.1-8.5	7 	40 x 30, conical	Avoid full sun if possible, especially in Urban, Compact Neighborhood, and Downtown Tiers (Zone 8)	
<i>Celtis occidentalis</i> ‘Prairie Pride’	Prairie Pride Hackberry	3	Y				Y		Y	Y		Y	FS PS	6.0-7.8	6	40 x 40, round	More compact than species in youth; fewer spur branches and witches’ broom; less fruit	
<i>Cercidiphyllum japonicum</i>	Katsuratree	3	Y				Y		Y	Y			FS PS	5.6-7.5	4	50 x 30, variable	Needs supplementary water to establish	

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			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Cercis canadensis</i> subsp. <i>texensis</i> (formerly <i>C. reniformis</i>) ‘Oklahoma’, ‘Texas White’	Redbud (subspecies)	1		Y	Y	Y	Y			Y			PS	6.1-7.5	8 	15-25 x 20, compact, rounded	Thicker, more leathery leaves than eastern redbud; not a canopy tree in Rural/ Suburban Tiers
<i>Cornus kousa</i>	Kousa or Japanese Dogwood	1				Y	Y	Y*	Y	Y			PS	6.1-6.5	4	30 x 30, round	Many cultivars; <i>C. kousa</i> var. <i>chinensis</i> ‘Milky Way Select’ is best as a single-stemmed tree; not a canopy tree in Rural/ Suburban Tiers
<i>Corylus colurna</i>	Turkish Filbert, Hazel	3	Y				Y		Y				FS PS	5.6-7.0	5	40 x 25, pyramidal	Not commonly available
<i>Fagus sylvatica</i>	European Beech	3					Y		Y	Y			PS	6.1 - 7.8	7 	60 x 45, oval	Many cultivars available; slow-grower; doesn’t like extreme heat
<i>Ginkgo biloba</i> ‘Fastigiata’ (f. <i>fastigiata</i>), Princeton Sentry® (‘PNI 2720’)	Ginkgo (columnar cultivars)	3		Y	Y		Y	Y					FS PS	5.6-7.5	5	40-70 x (spread varies by cultivar), narrowly upright	Slow-growing, thin and open during first 15 to 20 years; male cultivars are preferred because fruit from female trees can smell rancid; ‘Fastigiata’ can be either male or female

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ginkgo biloba</i> ‘Autumn Gold’, Presidential Gold™ ('The President'), ‘Saratoga’	Ginkgo (cultivars)	3		Y	Y		Y	Y				FS PS	5.6-7.5	5	40-70 x (spread varies by cultivar), upright	Same as above	
<i>Gleditsia triacanthos</i> var. <i>inermis</i> Shademaster®, Skyline® ('Skycole')	Thornless Honeylocust (cultivars)	3	Y	Y				Y	Y			FS PS	6.2-8.5	7💧	60 x 40, rounded	Needs high pH soils; typically a poor performer as a street tree in the Durham area – there are many others better; species not recommended due to long thorns; all have messy fruit	
<i>Koelreuteria paniculata</i>	Goldenraintree	1		Y	Y	Y		Y	Y	Y		FS	4.6-9.0	9💧	40 x 40, round or vase	Do not plant in wet areas	
<i>Koelreuteria paniculata</i> ‘September’	‘September’ Goldenraintree	1		Y	Y	Y	Y	Y	Y			FS	4.6-9.0	9💧	40 x 40, round or vase	Flowers later in summer to early fall	
<i>Lagerstroemia</i> spp.	Crape Myrtles	NOTE: In order to get credit for any crape myrtle as a canopy tree, add a note on plans NOT to prune leaders, head back, or otherwise reduce height; and specify single-stem, or maximum 3-5 stems if multi-stemmed															
<i>Lagerstroemia fauriei</i> ‘Fantasy’	Crape Myrtle (white, very large)	2		Y	Y		Y	Y	Y			FS	5.1-6.5	8💧	40 x 30	White blossoms; excellent dark red bark; good fall color; may not harden off early enough in fall, likely due to fertilizer and watering	

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Lagerstroemia fauriei</i> ‘Kiowa’	Crape Myrtle (white, large)	2		Y	Y		Y	Y	Y				FS	5.1-6.5	8💧	20-30 x 25	Same as above, but cold-hardy; flowering longer than other <i>L. fauriei</i> cultivars; cinnamon-brown bark; not a canopy tree in Rural/ Suburban Tiers
<i>Lagerstroemia fauriei</i> ‘Townhouse’	Crape Myrtle (white, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.6	8💧	30 x 20	Same as <i>L. fauriei</i> ‘Fantasy’ above; darker, exfoliating, wine-red bark
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Basham’s Party Pink’	Crape Myrtle (lavender-pink, large)	2		Y	Y		Y	Y	Y				FS	5.1-6.5	8💧	20-35 x 25	Lavender-pink blossoms; orange-red fall color; not a canopy tree in Rural/ Suburban Tiers
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Biloxi’	Crape Myrtle (pale pink, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8💧	30 x 20	Pale pink blossoms; red fall color; cinnamon colored exfoliating bark; a vigorous upright growth habit
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Byer’s Standard Red’	Crape Myrtle (red, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8💧	30 x 20	Red blossoms; orange fall color

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Hardy Lavender’ (‘Byer’s Hardy Lavender’)	Crape Myrtle (medium lavender, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8 	30 x 20	Medium violet/lavender blossoms; red fall color
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Muskogee’	Hybrid Crape Myrtle (light lavender, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8 	30 x 20	Light lavender blossoms; shiny brown/gray bark; more aphids and sooty mold than ‘Natchez’
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Natchez’	Crape Myrtle (white, large)	2		Y	Y	Y	Y	Y	Y				FS	6.1-7.8	8 	30 x 30	White blossoms; orange/red fall color; dark, cinnamon-brown, sinuous, mottled, exfoliating bark
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Sarah’s Favorite’	Crape Myrtle (white, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8 	30 x 15	White, long-lasting flowers and good red fall color; more cold-hardy than ‘Natchez’
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Whit IV’ (‘Red Rocket’)	Red Rocket® Crape Myrtle (red, large)	2		Y	Y	Y	Y	Y	Y				FS	5.1-6.5	8 	30 x 15	Red blossoms; bronze new leaf color; good cold tolerance; full sun best for disease-resistance
<i>Magnolia acuminata</i>	Cucumber Magnolia	3							Y	Y			FS PS	5.2-7.0	1	80 x 60, oval	Needs space; difficult to find; native to NC mountains

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
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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees							Buffers							
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge						Riparian
<i>Magnolia xsoulangiana</i>	Saucer Magnolia	2		Y	Y	Y	Y		Y	Y			FS PS	4.6-6.0	2	20-30 x 20, oval to round	Prefers moist, deep, acid soils rich in organic content; good pollution tolerance; try to avoid siting in cold, frost-prone areas for best flowering; not a canopy tree in Rural/ Suburban Tiers
<i>Magnolia stellata</i>	Star Magnolia	2		Y	Y	Y	Y		Y	Y			FS PS	4.6-6.0	2	20 x 15, oval to round	Avoid southern exposure and siting in cold, frost-prone areas for best flowering; not a canopy tree in Rural/ Suburban Tiers
<i>Magnolia tripetala</i>	Umbrella Magnolia	2					Y			Y			PS	5.6-7.5	2	35(40) x 25, oval to round	Vigorous, unkempt; prefers moist, shady locations; can attain heights of over 40 feet
<i>Metasequoia glyptstroboides</i>	Dawn Redwood	3							Y	Y			FS	4.5-7.5	5	80 x 60, pyramidal	Large deciduous conifer; needs a lot of space
<i>Parrotia persica</i>	Persian Parrotia	2			Y	Y	Y	Y	Y	Y			FS PS	5.1-6.5	4	30 x 30, round	Small canopy tree with three-season interest
<i>Phellodendron amurense</i>	Amur Corktree	3		Y	Y	Y	Y	Y	Y				FS PS	4.5-7.5	9💧	30 x 40	‘Macho’ and Shademaster® are fruitless clones; tough tree
<i>Pistacia chinensis</i>	Chinese Pistache	2	Y	Y	Y	Y	Y	Y	Y				FS PS	6.1-8.5	8💧	35 x 35, round	Tough, small canopy tree with good fall color

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Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers		Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵			
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge						Riparian
<i>Platanus xacerifolia</i> ‘Bloodgood’, ‘Liberty’, ‘Yarwood’, others	London Planetree (cultivars)	3					Y		Y	Y		Y	FS PS	5.6-7.5	5	70-90 x 60-80, large, wide-spreading, irregular	Hybrid sycamore; tougher than <i>P. occidentalis</i> ; very adaptable to soil conditions, moisture and pH; very pollution-tolerant; resists pest and disease problems better than species; needs room to grow; use cultivars
<i>Populus deltoides</i>	Eastern Cottonwood	3							Y	Y			FS	4.6-6.5	6	80 x 50 upright	Needs space; prefers wetter sites; short lived; brittle wood
<i>Prunus</i> x ‘Okame’ (and other <i>P. incise</i> x <i>P. campanulata</i> hybrids)	Okame Cherry	2		Y	Y	Y	Y	Y	Y	Y			FS PS	5.0-7.0	4	25 x 30, round (typical) varies by cultivar	Good heat-tolerance; three-season interest; better longevity than many other cherries; not a canopy tree in Rural/Suburban Tiers
<i>Prunus sargentii</i> ‘Columnaris’	Upright Sargent Cherry	1		Y	Y	Y	Y		Y				FS	4.5-7.5	7💧	20-35 x 10-15, columnar or narrow vase	Large pink flowers later than the species, ahead of leaves; fall color yellow-bronze-red; fruit; not as heat-tolerant as <i>P. subhirtella</i> or <i>P. xyedoensis</i> ; not a canopy tree in Rural/Suburban Tier unless > 30 feet

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
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Prunus sargentii</i> ‘Accolade’, ‘Hillieri’, ‘Spire’ (‘Hillier Spire’)	Sargent Cherry hybrids	2		Y		Y	Y		Y				FS PS	5.0-7.0	4	20-30 x 30, rounded (typical), varies by cultivar	Numerous cultivars; needs cool locations; three-season interest; somewhat short-lived; prone to pests and disease; this cherry is better north of Zone 7; not a canopy tree in Rural/ Suburban Tier
<i>Prunus serrulata</i> ‘Kwanzan’ (‘Kanzan’, ‘Sekiyama’)	‘Kwanzan’ Cherry (Japanese double-flowering hybrids)	2				Y	Y		Y	Y			FS PS	5.0-7.0	4	20-30 x 25, rounded typical	Usually grafted onto <i>P. avium</i> (Mazzard Cherry) understock; trees grown on own rootstock are rarer, but usually longer-lived and larger; grafted trees somewhat short-lived; typical cherry pests and diseases; this cultivar and those following are not canopy trees in Rural/ Suburban Tiers
<i>Prunus serrulata</i> ‘Shirotae’ (‘Mt. Fuji’), ‘Snowgoose’ (<i>P. incise</i> x <i>P. speciosa</i>), others	Japanese Cherry (single-flowering hybrids)	2				Y	Y		Y	Y			FS PS	5.0-7.0	4	20-30 x 25, rounded typical, varies by cultivar	Same as above; numerous cultivars; ‘Snowgoose’ somewhat pest-resistant, and performs well in Zone 7

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<i>Prunus subhirtella</i> var. <i>autumnalis</i> ‘Autumnalis’, ‘Autumnalis Rosea’, ‘Rosy Cloud’ (‘Pink Cloud’)	Higan Cherry (upright cultivars)	2		Y	Y	Y	Y	Y	Y	Y		PS	5.0-7.0	4	20-30 x 15-35, rounded, spreading; varies by cultivar	This cherry, ‘Okame’, and ‘Yoshino’ are the better cherries for the South; once established, can be long-lived; three- season interest; this cultivar and those following are not canopy trees in Rural/ Suburban Tiers	
<i>Prunus subhirtella</i> var. <i>pendula</i> ‘Pendula Rosea’, ‘Pendula Plena Rosea’, Pink Snow Showers™ (‘Pisnshzam’), others	Weeping Higan Cherry (cultivars)	2					Y		Y	Y		PS	5.0-7.0	4	20-25 x 20-30, weeping, rounded, spreading; varies by cultivar	Same as above, except more year-round interest due to form and bark; fast-growing	
<i>Prunus xyedoensis</i> ‘Afterglow’, ‘Pink Shell’, ‘Somei-Yoshino’	Yoshino Cherry	2		Y	Y	Y	Y	Y	Y	Y		PS	5.1-6.0	4	25-35 x 25-35, rounded, spreading, varies by cultivar	Washington, D.C., tidal basin cherry; good cherry for the South; three-season interest; somewhat short-lived (usually 25-40 years); cultivars less than 30 feet, and <i>P. xyedoensis</i> cultivars in the following rows, are not canopy trees in Rural/ Suburban Tiers	


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<i>Prunus xyedoensis</i> ‘Akebono’ ('Daybreak')	Akebono Cherry	2		Y	Y	Y	Y	Y	Y	Y			FS	5.1-6.0	2	25 x 25, vase-shaped	Pink flowers fade to white; rapid growth; retains leaves into early November	
<i>Prunus xyedoensis</i> ‘Berry’	Cascade Snow™ Yoshino Cherry	2		Y	Y	Y	Y	Y	Y	Y			PS	5.1-6.0	4	25 x 20, rounded, spreading	Three-season interest: pure white flowers, dark green foliage and good fall color; more resistant to cherry diseases	
<i>Prunus xyedoensis</i> ‘Shidare-yoshino’ ('Shidare Yoshino', f. <i>perpendens</i>)	Weeping Yoshino Cherry	2					Y		Y	Y			PS	5.1-6.0	4	20 x 30, weeping, rounded, spreading	White flowers in late March; year-round interest due to form (wildly-arching branches); somewhat short-lived (~25-40 years)	
<i>Pseudolarix amabilis</i>	Golden Larch	3					Y		Y*				FS PS	5.1-6.5	4	40 x 30, broad, pyramidal	Large deciduous conifer; slow growing; needs cool/protected location	
<i>Quercus macrocarpa</i>	Bur Oak	3					Y		Y*				FS PS	4.5-7.5	8 	70-80+ x same, spread, round	Not commonly available; needs space; best as a specimen in open areas	
<i>Quercus nuttallii</i> (<i>Q. texana</i>)	Nuttall Oak	3	Y				Y		Y	Y			FS	4.5-5.5	4	70 x 50	Needs space; acid clay soil; irrigation; cultivars available; tolerates wet soils	

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
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<i>Quercus robur</i> ‘Fastigiata’ (f. <i>fastigiata</i>), Skymaster® (‘Pyramich’), Skyrocket® (‘Fastigiata’)	English Oak (fastigate cultivars)	3	Y	Y	Y		Y	Y	Y	Y			FS PS	5.1-6.0	4	50 x 15, columnar	Mildew is a problem on ‘Fastigiata’; better than species for use in smaller spaces
<i>Quercus robur</i> ‘Fastigiata’ x <i>Q. bicolor</i> ‘Long’	Regal Prince® Hybrid Oak	3	Y	Y	Y		Y	Y	Y	Y			FS PS	4.7-6.3	8 	50 x 20, upright oval	Cross between fastigate English oak and swamp white oak; avoids mildew issues
<i>Quercus robur</i> x <i>Q. macrocarpa</i> ‘Clemons’	Heritage® Hybrid Oak	3	Y				Y	Y	Y	Y			FS PS	4.8-7.0	8 	60 x 40, oval, broadly rounded with age	Not commonly available; needs space
<i>Quercus rubra</i>	Northern Red Oak, Red Oak	3	Y				Y	Y	Y	Y		Y	FS PS	4.3-6.5	4	50 x 40, oval	Needs well-drained soil; not as well-adapted to Zone 7(8) due to heat and drought, so tends to be smaller here than in the North

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² Required Minimum Root Area (Trees): 1 = 150sf; 2 = 250sf; 3 = 350sf³ Sun Exposure: FS = Full Sun PS = Part Sun / Shade FS = Full Shade⁴ pH Range: 4.0 - 6.2 (Acid); 6.2 - 6.8 (Neutral); 6.8 - 9.0 (Basic)⁵ Wet/Dry and Soil Tolerance - see Figure 6, Plant Table Key, on page 37;Options 7, 8, and 9 are designated as a  (Waterwise) species

Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Salix alba</i> var. <i>sericea</i>	White Willow, Silky Willow	2										Y	FS	4.5-6.8	9 	60-75 x 50-60, rounded, low-branched, pendulous branches	Fast-growing; good for streambank stabilization; a NC DENR stormwater BMP tree
<i>Sophora japonica</i> (see <i>Styphnolobium japonicum</i>)																	
<i>Styphnolobium japonicum</i> (formerly <i>Sophora japonica</i>) Princeton Upright® ('Fleright'), Regent®	Japanese Pagodatree (cultivars)	2	Y				Y		Y				FS PS	5.1-7.5	8 	50 x 35, round to upright	Impressive white flowers; may not tolerate excessive heat; messy (drops flowers, fruit, leaves, etc.)
<i>Tilia cordata</i>	Littleleaf Linden (species only, not cultivars)	3	Y	Y	Y		Y		Y	Y			PS	4.8-7.2	4	60 x 30, pyramidal	Needs space; use species – cultivars tend to have disease problems in this area; not recommended for parking lots
<i>Ulmus minor</i> x <i>U. parvifolia</i> 'Frontier'	Frontier Elm	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	5.6-8.5	6	40 x 30, vase-shaped	Good vase shape in a medium- sized tree; red fall color reported, but not often seen
<i>Ulmus parvifolia</i> 'BSNUPF'	Everclear® Elm	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	5.6-8.5	6	60 x 15, columnar	Fastigate variety of Chinese elm

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Table 1B: Allowed Trees, Deciduous Canopy, Not Native to Durham		Requirements											Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes		
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵	
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian						
<i>Ulmus parvifolia</i> ‘Elmer I’, ‘Emerald Isle’	Athena® Elm	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	5.6-8.5	6	50 x 50, round	Round-crowned cultivar of Chinese elm	
<i>Ulmus parvifolia</i> ‘Elmer II’, ‘Emerald Vase’	Allee® Elm	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	5.6-8.5	6	60 x 50, vase-shaped	Needs space; larger than Athena®	
<i>Ulmus parvifolia</i> ‘UPMTF’	Bosque® Elm	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	5.6-8.5	6	60 x 30, round	Needs space; more upright than Athena® or Allee®	
<i>Zelkova serrata</i>	Japanese Zelkova	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	4.5-7.5	6	70 x 60, vase-shaped	Needs space; straight trees are rare in the species	
<i>Zelkova serrata</i> ‘Mushashino’ (‘Iruma Sango’)	‘Musashino’ Zelkova	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	4.5-7.5	6	45-60 x 15, columnar	Columnar selection; upright; tightly- and densely-branched; yellow fall color	
<i>Zelkova serrata</i> ‘ZSFKF’	Myrimar® Zelkova	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	4.5-7.5	6	50 x 40, round	Bred for tolerance of Southeastern growing conditions; orange-brown fall color	
<i>Zelkova serrata</i> Village Green™, Green Vase®	Zelkova (cultivars)	2	Y	Y	Y*		Y	Y	Y	Y			FS PS	4.5-7.5	6	70 x 60, vase-shaped	Vase-shaped cultivars; fall color varies by cultivar; both better than species in Zone 7	

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Options 7, 8, and 9 are designated as a ♠ (Waterwise) species

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Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham

Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Chamaecyparis thyoides</i> ‘Emily’ (‘Webb #1’), ‘Rachael’ (‘Webb #2’), ‘Red Star’ (‘Rubicon’)	Atlantic Whitecedar, Whitecedar Falsecypress cultivars	2					Y			Y	Y	Y	FS	5.5-6.8	9💧	20-30 x 13-20, upright, conical	Prefers wet areas, swamps; needles turn brown second year but persist; not for shade; only those trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Gordonia lasianthus</i>	Loblolly-Bay	2							Y	Y		Y	FS	4.5-5.8	1	30-50 x 10-15, sparse when young; narrow, pyramidal with age	Hard to grow under cultivation; grows submerged in water in wild; more native to coastal plain rivers and swamps; NC DENR stormwater BMP tree
<i>Ilex opaca</i>	American Holly (species and larger cultivars)	1					Y		Y	Y	Y	Y	PS SH	5.5-6.2	4	30 x 18, densely pyramidal	Denser in full sun; slow growth; cultivars tend to be more robust

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Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex vomitoria</i> and ‘Dodd’s Cranberry’ (‘Gray’s Green Leaf’, ‘Gray’s Greenleaf’), ‘Hightower’, ‘Kathy Ann’ (‘Kathy Ann Batson’), others	Yaupon Holly (species and tall, upright cultivars)	1					Y	Y	Y	Y	Y	Y	FS PS	5.5-6.8	8 	20-25(30) x 6-12(20), tall, upright, dense, irregularly rounded	Can be pruned into tree form; adaptable in a range of very dry to wet conditions; tolerates salt spray and pruning; good as a specimen, in groupings, hedges; poisonous leaves
<i>Juniperus virginiana</i> ‘Emerald Sentinel’ (‘Corcorcor’), ‘Glauca’, others	Eastern Redcedar (medium-tall, columnar cultivars)	1				Y	Y	Y*	Y	Y			FS	4.0-6.8	7 	15-30 x 6-8, columnar	Does not tolerate wet sites; needs full sun; tolerates dry conditions and poor soils, but best in deep, loamy soils with good drainage; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Juniperus virginiana</i> and ‘Brodie’ (<i>J. silicicola</i> form), others	Eastern Redcedar (species and tall, tree-form cultivars)	1				Y	Y	Y*	Y	Y			FS	4.0-6.8	7 	20-40 x 8-20, columnar to pyramidal	Same as above; form depends on cultivar; species is variable; only those trees attaining and maintained at least 20 feet in height at maturity are canopy trees

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
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Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Magnolia grandiflora</i> ‘Bracken’s Brown Beauty’	‘Bracken’s Brown Beauty’ Magnolia	3	Y				Y	Y*	Y	Y	Y		FS PS	5.5-6.2	8💧	30-50 x 15-30, pyramidal	A fuller specimen than the species; susceptible to cold, although one of most cold-hardy; needs space; slow growth rate
<i>Magnolia grandiflora</i> and ‘Claudia Wannamaker’, ‘D.D. Blanchard’	Southern Magnolias (species and large-growing cultivars)	3	Y				Y	Y*	Y	Y	Y		FS PS	5.5-6.2	8💧	60 x 30, pyramidal	Slow growth rate; susceptible to cold; larger varieties need space
<i>Magnolia grandiflora</i> ‘Hasse’	‘Hasse’ Southern Magnolia	2	Y	Y	Y*		Y	Y*	Y	Y	Y		FS PS	5.5-6.2	8💧	40 x 15, narrowly pyramidal	Susceptible to cold; slow growth rate; not easy to transplant; recommended for use in Downtown and Urban Tiers
<i>Magnolia grandiflora</i> ‘Little Gem’	‘Little Gem’ Southern Magnolia	1		Y	Y*	Y	Y	Y*	Y	Y	Y		FS PS	4.5-5.5	8💧	20 x 10, ovate, pyramidal	Dense; compact; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees

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Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Magnolia grandiflora</i> ‘MGTIG’	Greenback™ Southern Magnolia	2	Y	Y	Y*		Y	Y*	Y	Y	Y		FS PS	5.5-6.2	8💧	30 x 12, dense, tightly branched, narrowly pyramidal	Susceptible to cold; slow growth; good screening or large container plant; recommended for use in Downtown and Urban Tiers; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Magnolia grandiflora</i> , ‘Saint Mary’ (‘Glen St. Mary’)	‘St. Mary’ Southern Magnolia	1				Y	Y	Y*	Y	Y	Y		FS PS	4.5-5.5	8💧	18-22 x 10-20, ovate, pyramidal	Compact; bushy; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Magnolia grandiflora</i> ‘TMGH’	Alta® Magnolia	1	Y	Y	Y*		Y	Y*	Y	Y	Y		FS	4.5-5.5	8💧	25-35 x 10-15, columnar	Makes an excellent screening plant
<i>Pinus taeda</i>	Loblolly Pine	2	Y				Y		Y	Y		Y	FS PS	5.5-6.5	1 to 2	60 x 40, in landscape, oval, rounded crown	Pioneer plant; rapid growth; existing mature pines in good condition can be used as street trees in Rural/ Suburban Tiers

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Table 1C: Allowed Trees, Evergreen Canopy, Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Prunus caroliniana</i>	Carolina Cherrylaurel	2				Y	Y		Y	Y	Y	Y	FS PS	5.5-6.2	1 to 2	20-30(40) x 15-25, pyramidal to oval	Tree form; can be pruned to a hedge; fast grower; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Prunus caroliniana</i> ‘Compacta’	Bright ‘N Tight™ Carolina Cherrylaurel	2				Y	Y		Y	Y	Y	Y	FS PS	5.5-6.2	1 to 2	20 x 15, pyramidal to oval	Same as above but usually superior to species; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees

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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham

Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements									Recommended Cultural Information						
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Calocedrus decurrens</i>	California Incensecedar (species and tall cultivars)	2					Y*			Y	Y		FS	6.2-6.8	7 	30-50+ x 8-10, narrowly pyramidal	Prefers moist, well-drained, fertile soil, but tolerant of many soil types; intolerant of smog, pollution, and high wind areas; once established, is drought- and heat-tolerant
<i>Cedrus deodara</i> , and ‘Compacta’, Mystic Ice® (‘CDMTF1’), Wyndimere® (‘CDMTF2’), others	Deodar Cedar (species and tall cultivars)	3					Y		Y*	Y			FS	6.0-7.5	6	40-70 x 40-70, broadly pyramidal	Not cold-hardy; generally prefers Zones 7 to 9; specimen tree; needs space and shelter from wind; foliage color varies by cultivar
<i>Chamaecyparis pisifera</i> ‘Filifera’	Threadleaf Falsecypress	2					Y			Y	Y		FS	5.5-6.5	4	40-50+ x 10-20, loose, open pyramidal	Prefers moist, well-drained soil, and humid atmosphere; specimen plantings, possible use in a hedge; protect from winter wind and sun; deer-resistant; , slender, threadlike branchlets

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
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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees					Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Chamaecyparis pisifera</i> ‘Plumosa’, ‘Plumosa Aurea’	Plume Falsecypress	2					Y			Y	Y		FS	5.5-6.5	4	40-70+ x 10-30, loose, open pyramidal	Same as above, except branches are feathery to fernlike sprays
<i>Chamaecyparis pisifera</i> ‘Squarrosa’	Moss Falsecypress	2					Y			Y	Y		FS	5.5-6.5	4	30-40+ x 10-20, dense pyramidal	Same as above, except is more soft and fluffy
<i>Cryptomeria japonica</i> , and ‘Yoshino’, others	Japanese Cedar, Japanese Cryptomeria (species and tall cultivars)	2					Y	Y*	Y	Y	Y		FS	5.5-7.0	2	30-50 x 20-80, pyramidal or conical	Needs space and shelter from wind; proven cultivars for Durham area are best



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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>xCupressocyparis leylandii</i>	Leyland Cypress	2								Y	Y		FS	5.5-7.5	7 	20-50 x 5-12, upright pyramidal tree, full to the ground Best results from container-grown stock (stringy, sparse root system); grown in full sun (not for shade); many cultivars; withstands salt exposure; not for wet soils; has been overused, so risk of loss to disease and insects is high; should not be over-planted; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees	
<i>Cupressus arizonica</i> var. <i>glabra</i> ‘Blue Ice’, ‘Blue Pyramid’, ‘Tar Heel Blue’	Arizona Cypress, Smooth Cypress	2					Y	Y*	Y	Y	Y		FS	6.5-8.0	7 	20-30 x 4-20, narrow to broadly pyramidal Will thin with competition; subject to canker and not long-lived; can become more open with age; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees	

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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Eriobotrya japonica</i>	Loquat	2					Y			Y			FS	5.8-7.4	7💧	15-25 x 15-25, large, broad-spreading, rounded	Give protection from winter sun and wind in Zone 7b; prefers moist, well-drained soils, but adaptable once established, showing some drought resistance; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Ilex aquifolium</i> cultivars ‘Balkans’, ‘San Gabriel’, Sparkler® (‘Monler’), others	English Holly (tall cultivars)	2					Y		Y	Y	Y		FS PS	5.0-7.0	7💧	25-40 x 15-25, upright	Best berries if both males and females used; good hedges; dense; for this and all <i>Ilex</i> species and cultivars, only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Ilex xattenuata</i> (<i>I. cassine</i> x <i>I. opaca</i>) ‘Fosteri’ hybrids, ‘East Palatka’, ‘Foster’s #2’, ‘Hume #2’, ‘Savannah’	Foster’s Hybrid Hollies (tall cultivars)	1					Y	Y*	Y	Y	Y		FS PS	5.5-6.2	4	20(25)-30 x 12, densely-pyramidal	Limb-up if used as street tree; transplant shock often causes heavy leaf drop and long recovery; ‘Foster’s #2’ is good for hedges; ‘Savannah’ can be chlorotic, especially in high pH

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
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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex cornuta</i> Berries Jubilee™ ('Greer') 'Burfordii', 'D'Or', 'Dazzler', 'Fineline' ('Fine Line'), 'Needlepoint' ('Anicet Delcambre', 'Willowleaf'), others	Chinese Holly (medium to tall cultivars)	1					Y		Y	Y	Y		FS	5.5-7.4	8💧	8-20 x 6-20, (depends on cultivar, and form wanted), dense, bushy, rounded	Tolerant of a range of soil, pH, exposure, heat and drought conditions; spiny foliage; sensitive to very cold conditions; can be trained into tree form
<i>Ilex</i> 'Emily Bruner' (<i>I. cornuta</i> 'Burfordii' x <i>I. latifolia</i>), 'Arthur Bruner', 'Bob Bruner', 'Ginny Bruner'	'Emily Bruner' Holly, et al	1					Y	Y*	Y	Y	Y		FS PS	5.0-6.5	7💧	20-30 x 10-18, broadly pyramidal	A dense form with large, dark green, evergreen leaves; 'Emily Bruner' (sometimes 'Emily Brunner', 'Emily Brumer') and 'Ginny Bruner' have large, red fruits and 'James Swan' is the male pollinator; others are male
<i>Ilex latifolia</i> 'Mary Nell' (<i>I. cornuta</i> 'Burfordii' x <i>I. pernyi</i> 'Red Delight' x <i>I. latifolia</i>)	'Mary Nell' Holly	1					Y*	Y*	Y	Y	Y		FS PS	5.0-6.5	7💧	20-25 x 10, pyramidal	Leaves are large, magnolia-sized, spiny, and dark green; flowers are fragrant, yellow-white in early April; lots of red fruit; full and dense but requires pruning to keep dense and full

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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex</i> ‘Nellie R. Stevens’ <i>(I. cornuta x I. aquifolium)</i>	‘Nellie R. Stevens’ Holly	1				Y*	Y	Y*	Y	Y	Y		FS PS	4.5-7.0	7💧	25-30 x 10-12, broadly pyramidal	Relatively fast-growing; limb-up if used as a small street tree under power lines; pollinated by male <i>I. cornuta</i> .
<i>Magnolia virginiana</i>	Sweetbay Magnolia	1					Y		Y	Y			FS PS	4.5-6.0	6	15-40 x 10-25, upright, pyramidal, spreading	Multi-stem tree; really only semi-evergreen; does well in wet, even swampy conditions; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Picea orientalis</i>	Oriental Spruce	2								Y			FS PS	5.5-6.4	4	40-60 x 20-25, slender, pyramidal, with drooping branches	Prefers moist, well-drained, deep, rich soils, but tolerates poor, gravelly soils; provide winter wind protection; does okay in Zone 7, but not as fast or vigorous as in the North; dwarf and weeping cultivars also available (not as canopy trees)
<i>Pinus palustris</i>	Long Leaf Pine	3					Y*					Y*	FS	6.0-7.0	1-2	50 x 30	Not suitable for heavy clay or compacted soils; prefers well-drained sandy soils; native to Coastal Plain

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Table 1D: Allowed Trees, Evergreen Canopy, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Quercus myrsinifolia</i>	Chinese Evergreen Oak	2	Y	Y	Y	Y	Y	Y			Y		FS PS	4.5-6.5	4	20-30+ x 20, round	Good for street trees, parking lots, containers; very tolerant of soil ranges; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Quercus virginiana</i>	Live Oak	3	Y*				Y*						FS PS	4.5-6.5	4	40 x 60, broadly spreading	Successful street tree; needs space; tolerant of compacted soils but prefers sandy soil; outside of urban areas, winters can be too cold for this tree in Durham
<i>Thuja plicata</i> ‘Green Giant’	‘Green Giant’ Western Arborvitae	1					Y		Y	Y	Y		FS PS	6.2-7.4	5	20-40 x 8-15, upright, dense, fine-textured	Prefers moist, fertile, well-drained soils; pH-adaptable; reportedly does not do well in dry conditions; species as a whole is not well-suited to the South; only trees attaining and maintained at least 20 feet in height at maturity are canopy trees
<i>Tsuga caroliniana</i>	Carolina Hemlock	2					Y		Y	Y		Y	PS SH	4.2-5.9	1	45 x 20, pyramidal	Not drought-tolerant; needs protected location and well-drained soil; can be too hot in the Durham area, especially in urban areas

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Options 7, 8, and 9 are designated as a ♠ (Waterwise) species

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Table 1E: Allowed Trees, Deciduous Understory, Native to Durham

Table 1E: Allowed Trees, Deciduous Understory, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer saccharum</i> subsp. <i>leucoderme</i>	Chalk Maple	1				Y	Y	Y*	Y	Y		Y	FS PS	5.5-7.0	7💧	25-30 x 15-30, oval, rounded	Fall color comparable to <i>Acer saccharum</i>
<i>Acer pensylvanicum</i>	Striped Maple	1				Y		Y*	Y	Y			PS SH	5.5-7.0	1	15-20 x 15-20, broad, rounded crown	Fall color and bark interesting; better for naturalizing than for formal plantings
<i>Aesculus pavia</i>	Red Buckeye	1				Y	Y	Y	Y	Y		Y	PS SH	5.0-7.0	5	10-20 x 15-25, broad, spreading habit	Tends to sucker and form colonies
<i>Amelanchier arborea</i>	Serviceberry	1				Y	Y	Y*	Y	Y			FS PS	6.2-6.8	8💧	20 x variable, ovate	Multi-stemmed, shrubby
<i>Aralia spinosa</i>	Devils-Walkingstick	1							Y	Y			FS PS	5.5-7.2	9💧	12-20 x 8-10, upright, open habit	Tolerant of urban conditions; needs room to spread

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

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Table 1E: Allowed Trees, Deciduous Understory, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Asimina triloba</i>	Pawpaw	1					Y		Y	Y			FS PS	5.2-7.2	4	15-20 x 15-20, dense, pyramidal/round-topped	Native to woodlands; prefers deep, moist, fertile soils; somewhat difficult to transplant; edible fruit
<i>Carpinus caroliniana</i>	American Hornbeam	1		Y	Y	Y	Y	Y	Y	Y			FS SH	4.0-7.0	5	20-30 x 20-30, oval	Slow-growing; if used in Urban, Downtown, or Compact Neighborhood Tiers, provide some winter sun and wind protection, and good drainage; somewhat difficult to transplant; should be B & B
<i>Celtis tenuifolia</i>	Dwarf Hackberry	2				Y		Y*	Y	Y		Y	FS PS	5.0-7.0	7 	25 x 25	Small, native tree or large shrub
<i>Cercis canadensis</i> and ‘Flame’, ‘Forest Pansy’, ‘Rubye Atkinson’	Eastern Redbud (species and cultivars)	1				Y	Y	Y*	Y	Y			PS SH	4.5-7.5	5	20-30 x 25-30, round, spreading	‘Forest Pansy’ cultivar valued for purple foliage
<i>Chionanthus virginicus</i>	White Fringetree	1				Y	Y	Y	Y	Y			PS	4.5-6.5	2	12-20 x 12-20, spreading, open	Can be a shrub or small tree; use tree-form only if will be a required street tree under power lines

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Cornus florida</i> and ‘Cloud 9’, ‘White Cloud’, ‘Rubra’, var. <i>rubra</i> ‘Cherokee Chief’	Flowering Dogwood (species and cultivars)	1				Y*	Y		Y	Y		Y	PS SH	5.0-7.0	4	20-30 x 20-30, broad, spreading	Cultivars more disease-resistant than species; ‘Rubra’ and ‘Cherokee Chief’ have pink flowers, others white
<i>Cotinus obovatus</i>	American Smoketree	1				Y	Y	Y	Y	Y			FS PS	6.5-8.0	7💧	15-30 x 15-25, rounded, spreading	Valued for bluish green foliage and brilliant fall color
<i>Crataegus crusgalli</i>	Cockspur Hawthorn	2										Y	FS	5.5-7.4	8💧	20-30 x 20-35, rounded, spreading, dense, horizontal branching	Dangerous two-inch thorns; best not to use near children; a NC DENR stormwater BMP tree; credited for riparian buffer restoration only
<i>Crataegus marshallii</i> (and other Southeastern <i>Crataegus</i> species)	Mayhaw Hawthorn	2										Y	FS PS	5.8-7.2	8💧	15-30 x 15-30, rounded, spreading, dense	Very thorny; a NC DENR stormwater BMP tree; credited for riparian buffer restoration only
<i>Halesia carolina</i> (<i>H. tetraptera</i>)	Carolina Silverbell	1	Y			Y	Y	Y*	Y	Y			FS PS	5.0-6.0	2	20(30)-40 x 15-35, broad, rounded	Needs moist, well-drained soils; can tolerate rocky soils, but not drought

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Hamamelis virginiana</i>	Witchhazel	1				Y	Y		Y	Y		Y	FS PS	4.5-6.2	2	15-20 x 15-20, irregular, open crown	More symmetrical when grown in full sun; tolerant of urban conditions
<i>Ilex decidua</i>	Possumhaw	1				Y			Y	Y		Y	FS PS	3.5-6.5	8💧	10-15 x 8-12, vase-shaped	Best berry set with use of one male plant for every 3-5 female plants
<i>Osmanthus americanus</i>	Devilwood	1							Y	Y			FS PS	5.5-6.8	9💧	12-20 x 8-12, loose, open, rounded	Found in the wild along swamp margins and streams; some urban tolerance
<i>Ostrya virginiana</i>	American Hophornbeam, Ironwood	2		Y	Y	Y	Y	Y	Y	Y		Y	FS PS	4.2-7.6	8💧	25-40 x 20-30, pyramidal, becoming rounded with age	Not commonly available, but has good tolerance of urban conditions
<i>Oxydendrum arboreum</i>	Sourwood	2				Y	Y		Y	Y		Y	FS PS	4.0-6.5	7💧	25-30 x 20, pyramidal	Intolerant of pollution and/or urban conditions

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

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Table 1E: Allowed Trees, Deciduous Understory, Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Salix caroliniana</i>	Coastal Plain Willow	1										Y	FS	4.5-6.8	9💧	15-30 x 15-30, rounded, irregular, dense	Prefers Coastal Plain conditions; often used in stream-bank stabilization; a NC DENR stormwater BMP tree
<i>Sassafras albidum</i>	Sassafras	2					Y		Y	Y			FS	4.5-7.2	7💧	35 x 35, irregular, pyramidal	Tends to sprout from roots and form extensive thickets; difficult to cultivate and transplant (poor root system) and hard to find, especially in larger sizes
<i>Vaccinium arboreum</i>	Sparkleberry, Farkleberry	1					Y		Y	Y			PS SH	4.0-7.0	7💧	12-18 x 12-18, spreading habit	Very heat- and drought-tolerant; difficult to cultivate and not widely available; exfoliating bark; edible fruit

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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham

Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Acer palmatum</i> var. <i>atropurpureum</i> ‘Bloodgood’	Bloodgood Japanese Maple	1		Y	Y		Y	Y*					FS PS	5.1-7.8	7	20 x 30, vase	Slow growing, eventually reaching 20 feet; reddish foliage
<i>Acer truncatum</i>	Shantung Maple	1		Y	Y	Y	Y	Y	Y				FS PS	5.5-7.4	7	20-25 x 20, small, rounded, dense	Tough, heat and drought-tolerant small maple
<i>Cercis canadensis</i> subsp. <i>texensis</i> (formerly <i>C. reniformis</i>) ‘Oklahoma’, ‘Texas White’	Redbud (subspecies)	1		Y	Y	Y	Y	Y*		Y			PS	6.1-7.5	8	15-25 x 20, vase	Thicker, more leathery leaves than eastern redbud
<i>Cercis chinensis</i> ‘Avondale’	Chinese Redbud	1		Y	Y	Y	Y	Y*		Y*			PS	6.1-7.5	4	10 x 15, vase	Shrubbier and more showy than eastern redbud; more flowers and seedpods
<i>Chionanthus retusus</i>	Chinese Fringetree	1					Y	Y		Y		Y	FS PS	5.5-6.8	8	15-25 x 12-15, rounded	Large, multi-stemmed shrub, but can be grown as a small tree; tough; snow white flowers
<i>Cornus kousa</i>	Kousa or Japanese Dogwood	1				Y	Y	Y*	Y	Y			PS	6.1-6.5	4	30 x 30, round	Many cultivars; <i>C. kousa</i> var. <i>chinensis</i> ‘Milky Way Select’ is best as a single-stemmed tree

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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Cotinus coggygria</i>	Smoketree	1				Y	Y	Y*	Y	Y			FS	6.1-7.8	7💧	15 x 15, round	Multi-stemmed; shrubby
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> ‘Powhatan’, ‘Seminole’, others	Crape Myrtle (small <i>L. indica</i> cultivars)	1				Y	Y	Y	Y	Y*			FS	4.5-8.0	8💧	8-15 x 6-15, form varies by cultivar	Multiple bloom color selections; good fall color; winter bark
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> cultivars ‘Arapaho’, ‘Byers Wonderful White’, ‘Catawba’, ‘Choctaw’, ‘Dallas Red’, Dynamite® (‘Whit II’), ‘Lipan’, ‘Miami’, ‘Osage’, ‘Regal Red’, ‘Sioux’, ‘Tuscarora’, ‘Tuskegee’, ‘Yuma’, others	Crape Myrtle (medium-sized)	1		Y	Y	Y	Y	Y	Y	Y*			FS	4.5-8.0	8💧	15-20 x 10-15, form varies by cultivar	Same as above
<i>Magnolia</i> ‘Jane’ (<i>M. liliiflora</i> ‘Nigra’ x <i>M. stellata</i> ‘Rosea’), and other related ‘girls’	‘Jane’ Saucer Magnolia	1					Y	Y	Y	Y			FS PS	5.6-7.5	2	8-15 x 15, oval to round	Several others with girls’ names that are often confused

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
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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Magnolia xloebneri</i> ‘Ballerina’, ‘Leonard Messel’, ‘Merrill’	Loebner Magnolia	1					Y		Y	Y			FS PS	4.6-6.5	5	18-25 x 20-25, rounded, spreading	Flowers later than Saucer Magnolias; like Star Magnolia
<i>Magnolia xsoulangiana</i>	Saucer Magnolia	1		Y	Y		Y	Y*	Y	Y			FS PS	4.6-6.0	2	20-30 x 20, oval to round	Prefers moist, deep, acid soils rich in organic content; good pollution tolerance; avoid siting in cold, frost-prone areas for best flowering
<i>Magnolia stellata</i>	Star Magnolia	1		Y	Y	Y	Y	Y*	Y	Y			FS PS	4.6-6.0	2	20 x 15, oval to round	Avoid southern exposure and siting in cold, frost-prone areas for best flowering
<i>Malus</i> hybrids ‘Adirondack’, ‘David’, <i>floribunda</i> , ‘Prairifire’, Sugar Tyme® (‘Sutgzam’)	Flowering Crabapple (disease-resistant hybrids)	1				Y	Y						FS	5.0-6.5	2	Up to 20 x 20, round	Do not plant with Junipers due to crabapple rust; these cultivars are more disease-resistant than the species, but still need to be maintained
<i>Prunus mume</i>	Japanese Apricot	1		Y	Y	Y	Y	Y*	Y	Y			FS	5.6-6.0	2	15 x 20, vase	Best in groupings
<i>Prunus</i> x ‘Okame’ (and other <i>P. incise</i> x <i>P. campanulata</i> hybrids)	Okame Cherry	2		Y	Y	Y	Y	Y	Y	Y			FS PS	5.0-7.0	4	25 x 30, round (typical) varies by cultivar	Good heat-tolerance; three-season interest; better longevity than many other cherries

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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Prunus sargentii</i> ‘Accolade’, ‘Hillieri’, ‘Spire’ (‘Hillier Spire’)	Sargent Cherry hybrids	2		Y	Y	Y	Y	Y*	Y	Y			FS PS	5.0-7.0	4	20-30 x 30, rounded (typical), varies by cultivar	Numerous cultivars; needs cool locations; three-season interest; somewhat short-lived; prone to pests and disease; this cherry is better north of Zone 7
<i>Prunus serrulata</i> ‘Kwanzan’ (‘Kanzan’, ‘Sekiyama’)	‘Kwanzan’ Cherry (Japanese double-flowering hybrids)	2				Y	Y	Y*	Y	Y			FS PS	5.0-7.0	4	20-30 x 25, rounded typical	Usually grafted onto <i>P. avium</i> (Mazzard Cherry) understock; trees grown on own rootstock are rarer, but usually longer-lived and larger; grafted trees somewhat short-lived; typical cherry pests and diseases
<i>Prunus serrulata</i> ‘Shirotae’ (‘Mt. Fuji’), ‘Snowgoose’ (<i>P. incise</i> x <i>P. speciosa</i>), others	Japanese Cherry (single-flowering hybrids)	2				Y	Y	Y*	Y	Y			FS PS	5.0-7.0	4	20-30 x 25, rounded typical, varies by cultivar	Same as above; numerous cultivars; ‘Snowgoose’ somewhat pest-resistant, and performs well in Zone 7
<i>Prunus subhirtella</i> var. <i>autumnalis</i> ‘Autumnalis’, ‘Autumnalis Rosea’, ‘Rosy Cloud’ (‘Pink Cloud’)	Higan Cherry (upright cultivars)	2		Y	Y	Y	Y	Y	Y	Y			PS	5.0-7.0	4	20-30 x 15-35, rounded, spreading, varies by cultivar	This cherry, ‘Okame’, and ‘Yoshino’ are the better cherries for the South; once established, can be long-lived; three- season interest

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
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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Prunus subhirtella</i> var. <i>pendula</i> ‘Pendula Rosea’, ‘Pendula Plena Rosea’, Pink Snow Showers™ (‘Pisnshzam’), others	Weeping Higan Cherry (cultivars)	2					Y		Y	Y			PS	5.0-7.0	4	20-25 x 20-30, weeping, rounded, spreading, varies by cultivar	Same as above except year-round interest due to form and bark; fast-growing
<i>Prunus xyedoensis</i> ‘Akebono’ (‘Daybreak’)	Akebono Cherry	1		Y	Y	Y	Y	Y	Y	Y			FS	5.1-6.0	2	25 x 25, vase-shaped	Pink flowers fade to white; rapid growth; retains leaves into early November
<i>Prunus xyedoensis</i> ‘Berry’	Cascade Snow™ Yoshino Cherry	2		Y	Y	Y	Y	Y	Y	Y			PS	5.1-6.0	4	25 x 20, rounded, spreading	Three-season interest: pure white flowers, dark green foliage and good fall color; more resistant to cherry diseases
<i>Prunus xyedoensis</i> ‘Shidare-yoshino’ (‘Shidare Yoshino’, f. <i>perpendens</i>)	Weeping Yoshino Cherry	2					Y		Y	Y			PS	5.1-6.0	4	20 x 30, weeping, rounded, spreading	White flowers in late March; year-round interest due to form (wildly-arching branches); somewhat short-lived (~25-40 years)
<i>Prunus xyedoensis</i> ‘Snow Fountains’ (‘White Fountain’)	‘Snow Fountains’ Cherry (weeping cultivars)	1					Y		Y	Y			PS	5.1-6.0	4	6-12 x 6-12, semi-weeping	Good fall color; may produce a few black fruits; somewhat short-lived (~25-40 years)

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Table 1F: Allowed Trees, Deciduous Understory, Not Native to Durham		Requirements											Recommended Cultural Information				
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹										Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Quercus georgiana</i>	Georgia Oak	2		Y	Y		Y	Y	Y	Y			FS	5.0-6.5	8💧	15-30 x 30, round	Species useful as small lawn, planter, or park tree; dark green summer foliage; red to reddish-purple fall color
<i>Salix humilis</i>	Prairie Willow	1										Y	FS	5.5-6.8	9💧	10-25 x 10-30, rounded, dense	Large shrub or small multi-stemmed tree; often used in streambank stabilization; a NC DENR stormwater BMP tree
<i>Styrax japonicus</i> (<i>Styrax japonica</i>)	Japanese Snowbell	1				Y		Y*	Y	Y			PS	5.6-7.5	4	20-30 x 20-30, round	Best in partial shade
<i>Symplocos tinctoria</i>	Horse-Sugar, Sweetleaf	1										Y	FS	5.1-6.0	4	20 x 20, round	Suckering; semi-evergreen

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Table 1G: Allowed Trees, Evergreen Understory, Native to Durham

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Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Chamaecyparis thyoides</i> ‘Emily’ (‘Webb #1’), ‘Rachael’ (‘Webb #2’), ‘Red Star’ (‘Rubicon’)	Atlantic Whitecedar, Whitecedar Falsecypress (cultivars)	2					Y			Y	Y	Y	FS	5.5-6.8	9 	15-30 x 13-20, upright, conical	Prefers wet areas, swamps; needles turn brown second year but persist; not for shade
<i>Ilex opaca</i> ‘Dan Fenton’, ‘Jersey Princess’, ‘Steward’s Silver Crown’, others	American Holly (smaller, upright cultivars)	1					Y		Y	Y	Y	Y	FS PS	5.0-6.5	7 	15-30 x 15-20, pyramidal	Slow growing; protect from winter wind and sun; must be pruned to maintain as an understory tree
<i>Ilex vomitoria</i> and ‘Dodd’s Cranberry’ (‘Gray’s Green Leaf’, ‘Gray’s Greenleaf’), ‘Hightower’, ‘Katherine’, ‘Kathy Ann’ (‘Kathy Ann Batson’), ‘Pride of Houston’, others	Yaupon Holly (species and tall, upright cultivars)	1					Y	Y	Y	Y	Y	Y	FS PS	5.5-6.8	8 	20-25(30) x 12(20), tall, upright, dense, irregularly rounded	Can be trained to tree form; must be pruned to maintain as an understory tree; adaptable in a range of very dry to wet conditions; tolerates salt spray and pruning; good as a specimen, in groupings, hedges; poisonous leaves

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Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
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<i>Ilex vomitoria</i> ‘Folsom’s Weeping’, ‘Pendula’ (f. <i>pendula</i>), ‘Stephens Weeping’	Yaupon Holly (weeping cultivars)	1					Y	Y	Y	Y		Y	FS PS	5.5-6.8	8💧	12-20+ x 6-12, tall, weeping form, irregular	Same as above
<i>Ilex vomitoria</i> ‘Shadow’s Female’	Shadow’s Female Yaupon	1					Y			Y	Y		FS	4.5-7.0	7💧	10-12 x 10-12, upright	Same as above
<i>Ilex vomitoria</i> ‘Will Fleming’	‘Will Fleming’ Yaupon Holly	1					Y	Y	Y	Y		Y	FS PS	5.5-6.8	8💧	10-15+ x 1.5-2, upright, columnar	Same as above
<i>Juniperus communis</i> ‘Hibernica’	Common Juniper	1								Y			FS	5.5-7.4	7💧	10-15 x 4-6, upright	Not as heat-tolerant as other junipers, otherwise tough plant; can be short-lived
<i>Juniperus virginiana</i> ‘Burkii’, ‘Hillii’, ‘Hillspire’ (‘Cupressifolia’), ‘Idyllwild’, ‘Manhattan Blue’, ‘Nova’, others	Eastern Redcedar (medium, upright-growing forms)	1						Y	Y*	Y	Y		FS	4.0-6.8	7💧	8-15 x 4-8, upright, conical, dense	Does not tolerate wet sites; needs full sun; tolerates dry conditions and poor soils, but best in deep, loamy soils with good drainage; must be pruned to maintain as an understory tree

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Juniperus virginiana</i> ‘Emerald Sentinel’ ('Corcorcor'), ‘Glauca’, others	Eastern Redcedar (medium-tall, columnar cultivars)	1						Y	Y	Y	Y		FS	4.0-6.8	7💧	15-30 x 6-8, columnar	Same as above
<i>Magnolia grandiflora</i> ‘Little Gem’	‘Little Gem’ Southern Magnolia	1				Y	Y	Y*	Y	Y	Y		FS PS	4.5-5.5	8💧	20 x 10, ovate, pyramidal	Dense; compact
<i>Magnolia grandiflora</i> , ‘Saint Mary’ ('Glen St. Mary')	‘St. Mary’ Southern Magnolia	1				Y	Y	Y*	Y	Y	Y		FS PS	4.5-5.5	8💧	18-22 x 10-20, ovate, pyramidal	Compact; bushy
<i>Myrica cerifera</i>	Southern Wax Myrtle	1					Y	Y	Y	Y	Y		FS PS	5.5-6.8	8💧	10-15 x 10-15, rounded, spreading	Tolerant of salt spray (sea-side plant); grows in sand and swamps, best in fertile, moist soils; can prune to densify or tree-form; can sucker and spread; thinner and more open in shade; can be damaged by cold weather
<i>Prunus caroliniana</i> ‘Compacta’	Bright ‘N Tight™ Carolina Cherrylaurel	2				Y	Y		Y	Y	Y	Y	FS PS	5.5-6.2	1 to 2	20 x 15, pyramidal to oval	Tree form; can be pruned to a hedge; fast grower; usually superior to species

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Table 1H: Allowed Trees, Evergreen Understory, Not Native to Durham

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Buxus sempervirens</i>	Common Boxwood (taller-growing cultivars)	1					Y			Y	Y		FS PS	5.5-7.5	4	15-20 x 15-20, rounded	Slow growing; not suitable for hot areas; new growth is sensitive to winter frosts; surface rooter – keep mulched
<i>Camelia japonica</i>	Japanese Camellia	1					Y		Y	Y	Y*		PS	5.5-6.0	4	10-15 (20-25) x 6-10, densely pyramidal, sometimes more open; formal and stiff	Add “No Pruning” note to plan; tree size not widely available; prefers moist, acid, high organic content, well-drained soils; high Pine shade best; shallow-rooted, so mulch and do not cultivate around base; bloom January-April, depending on cultivar; numerous cultivars with different color blooms, some double

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
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Table 1H: Allowed Trees, Evergreen Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Camellia sasanqua</i>	Sasanqua Camellia (species and large-growing cultivars)	1					Y	Y	Y	Y	Y*		FS PS	5.5-6.0	4	10-15 x 8-12, densely branched, rounded, multi-stem	Add “No Pruning” note to plan; tree size not widely available, but one of the hardiest camellias; shallow roots prefer mulch; smaller leaf, and more refined and open than <i>C. japonica</i> ; culture similar to <i>C. japonica</i> ; hardier than <i>C. Japonica</i> ; blooms September to December
<i>Chamaecyparis pisifera</i> ‘Boulevard’ (‘Squarrosa Cyano-vridis’), ‘Filifera Aurea’	Sawara or Japanese Falsecypress (medium-tall cultivars)	2					Y			Y	Y		FS	5.5-6.5	4	10-20 x 8-15, upright, dense, pyramidal	Prefers moist, well-drained soil, and humid atmosphere; specimen plantings, possible use in a hedge; protect from winter wind and sun; deer-resistant
<i>Cryptomeria japonica</i> ‘Black Dragon’, Chapel View™, ‘Dense Jade’, ‘Elegans’, ‘Gyrokuryu’	Japanese Cedar (medium-height cultivars)	2					Y			Y	Y		FS	5.5-6.2	5	10-15(30+) x 10-30, upright, pyramidal	Needs deep, rich, well-drained soil with dependable moisture, and protection from wind for best growth; withstands heat well; good specimen, groups, screening; tip and stem dieback a problem

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Table 1H: Allowed Trees, Evergreen Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
Scientific Name	Common Name	Required Minimum Root Area ²	Approved Location of Use Categories ¹									Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Eriobotrya japonica</i>	Loquat, Japanese Loquat	2					Y			Y			FS	5.8-7.4	7💧	15-25 x 15-25, broad-spreading, rounded large shrub/ small tree	Needs protection from winter sun and wind in Zone 7b (suburban/rural areas); prefers moist, well-drained soils, but adaptable once established, showing some drought-resistance; fruit can be a nuisance; fireblight
<i>Ilex xaquipernyi</i> cultivars ‘Brilliant’ (<i>I. aquifolium</i> x <i>I. ciliospinosa</i>), ‘Carolina Sentinel’, ‘Dragon Lady’, ‘Patricia Varner’, ‘San Jose’	Aquipern Holly (cultivars)	1					Y		Y	Y	Y		FS PS	5.0-6.5	7💧	12-25 x 8-15, upright, dense, pyramidal	Best berries if both males and females used; good hedges; dense; showy; ‘Aquipern’ is a male clone
<i>Ilex xattenuata</i> (<i>I. cassine</i> x <i>I. opaca</i>) Dixie™ series, ‘East Palatka’, ‘Foster’s #2’, ‘Hume #2’, ‘Savannah’	Foster’s Hybrid Hollies (tall cultivars)	1				Y	Y	Y*	Y	Y	Y		FS PS	5.0-6.5	7💧	25-30 x 6-10, upright, narrow, pyramidal	Must be pruned to maintain under 20 feet tall as an understory tree; transplant shock causes heavy leaf drop and long recovery; ‘Savannah’ tends to be chlorotic in high pH; good berries and leaf color otherwise; limb-up if used as a street tree; ‘Foster’s #2’ is good for hedges; Dixie™ series are slower-growing

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			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex cornuta</i> Berries Jubilee™ ('Greer') 'Burfordii', 'D'Or', 'Dazzler', 'Fineline' ('Fine Line'), 'Needlepoint' ('Anicet Delcambre', 'Willowleaf'), others	Chinese Holly (medium to tall cultivars)	1					Y	Y*	Y	Y	Y		FS	5.5-7.4	8💧	8-20 x 6-20, (depends on cultivar, and form wanted), dense, bushy, rounded	Tolerant of a range of soil, pH, exposure, heat and drought conditions; spiny foliage; sensitive to very cold conditions; can be trained into tree form; regular pruning required to maintain at shorter heights
<i>Ilex cornuta</i> 'Dwarf Burford', ('Burfordii Nana', 'Burfordii Compacta')	Dwarf Burford Holly	1				Y	Y	Y	Y	Y	Y		FS	5.5-7.4	8💧	10-20 x 10-20, ovate	Tolerates a range of soil, pH, exposure, heat and drought conditions; spiny foliage; sensitive to very cold conditions; can be trained to tree form; regular pruning required to maintain at shorter heights
<i>Ilex</i> 'Clusterberry' ('Nellie R. Stevens' x <i>I. leucoclada</i>)	'Clusterberry' Hybrid Holly	1					Y	Y	Y	Y	Y*		FS PS	6.2-7.4	7💧	6-10 x 6-10, rounded, spreading	Prefers loose, loamy, well-drained soils, but is adaptable; good specimen holly

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
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Table 1H: Allowed Trees, Evergreen Understory, Not Native to Durham		Requirements										Recommended Cultural Information					
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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex</i> ‘Dr. Kassab’ (‘Doctor Kassab’) (<i>I. cornuta</i> x <i>I. pernyi</i>)	‘Doctor Kassab’ Holly	1					Y	Y	Y	Y	Y		FS	5.0-6.5	7💧	15-20 x 10-18, pyramidal	Glossy, dark green-leaved, broad pyramid; female with excellent red fruits; prefers loose, loamy, well-drained soils, but is adaptable; good specimen holly
<i>Ilex</i> ‘Emily Bruner’ (<i>I. cornuta</i> ‘Burfordii’ x <i>I. latifolia</i>), also ‘Arthur Bruner’, ‘Bob Bruner’, ‘Ginny Bruner’	‘Emily Bruner’ Holly, et al	1					Y	Y*	Y	Y	Y		FS PS	5.0-6.5	7💧	20-30 x 10-18, broadly pyramidal	A dense form with large, dark green, evergreen leaves; ‘Emily Bruner’ (sometimes ‘Emily Brunner’ or ‘Emily Brumer’) and ‘Ginny Bruner’ have large, red fruits and ‘James Swan’ is the male pollinator; others are male (no fruit); widely available
<i>Ilex latifolia</i> ‘Mary Nell’ (<i>I. cornuta</i> ‘Burfordii’ x <i>I. pernyi</i> ‘Red Delight’ x <i>I. latifolia</i>)	‘Mary Nell’ Holly	1					Y	Y*	Y	Y	Y		FS PS	5.0-6.5	8💧	20-25 x 10, pyramidal	Big, magnolia-sized, spiny, dark green leaves; fragrant, yellow-white flowers in early April; lots of red fruit; full and dense but requires pruning to keep dense and full

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			Street Trees				Parks	Vehicle Use Areas	Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴			Wet/Dry and Soil Tolerance ⁵
			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Ilex</i> ‘Nellie R. Stevens’ (<i>I. cornuta</i> x <i>I. aquifolium</i>)	‘Nellie R. Stevens’ Holly	1				Y	Y	Y	Y	Y		FS PS	4.5-7.0	8💧	15-30 x 8-12, dense, broadly pyramidal	Relatively fast-growing; limb-up if used as a small street tree under power lines; prefers loose, loamy, well-drained soils, but is adaptable; good specimen holly; best fruit when pollinated by male <i>I. cornuta</i>	
<i>Ilex</i> Arcadiana™ (‘Magiana’), Cardinal™ (‘Conal’), Festive™ (‘Conive’), Liberty™ (‘Conty’), Little Red™ (‘Coned’), Oakleaf™ (‘Conaf’), Oakland™ (‘Magland’)	Red Hybrid Hollies	1					Y	Y	Y	Y		FS PS	5.0-6.5	7💧	10-15 x 5-8, upright, pyramidal	New growth is red- to purple-tinged; leaves prominently-spined; prefers loose, loamy, well-drained soils, but is adaptable; good specimen holly; best fruit with pollinating males	

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
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<i>Juniperus chinensis</i> ‘Ames’, ‘Blue Point’, ‘Columnaris Glauca’, ‘Fairview’, ‘Hooks’, ‘Kaizuka’ (‘Torulosa’), ‘Obelisk’, ‘Robusta Green’, ‘Spartan’, ‘Spearmint’, ‘Story’, ‘Wintergreen’, others	Chinese Juniper (tall and narrow cultivars)	1					Y	Y		Y	Y		FS	5.5-7.4	7💧	8-10(15+) x 2-6, erect, form depends on cultivar	Prefers moist, well-drained soils, but not wet, conditions; withstands dry conditions and drought once established; pH-adaptable; after 10-15 years, Chinese junipers can get much larger than specified in literature
<i>Juniperus scopulorum</i> ‘Pathfinder’, ‘Gray Gleam’, ‘Skyrocket’	Rocky Mountain Juniper	1					Y	Y		Y	Y		FS	5.5-7.5	8💧	15-20 x 4-8, narrow, columnar	Not well-suited to Zone 7; other juniper species handle high humidity and high night-time temperature of Southeast better; color varies by cultivar
<i>Loropetalum chinensis</i> var. <i>rubrum</i> ‘Burgundy’ (‘Akabana’), ‘Zhuzhou’	Burgundy Loropetalum, Chinese Witch Hazel, Fringe Flower (tall cultivars)	1					Y	Y*	Y	Y	Y		FS SH	4.5-6.5	4	8-20 x 6-15, rounded, arching	Purple and green leaf varieties available; pink and white flowering; can prune to multi-stem tree and to keep to desired height; size may vary within same cultivar; does not do well in high pH or dry soils

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<i>Osmanthus fragrans</i>	Fragrant Tea Olive	1					Y	Y*		Y	Y		PS SH	4.5-7.0	4	10-20 x 8-15, rounded, upright	Multi-stem tree; least hardy of the genus in cold weather; tallest growth along the Coast
<i>Osmanthus heterophyllus</i> (<i>O. ilicifolius</i>)	Holly Osmanthus	1					Y	Y*		Y	Y		PS SH	4.5-7.0	4	6-20 x 3-15, rounded, upright, depending on cultivar	Hardest of the genus; spiny leaves; good for borders, screens, hedges or formal specimen; nice smelling flowers in autumn
<i>Osmanthus xfortunei</i> (<i>O. heterophyllus</i> x <i>O. fragrans</i>)	Fortune’s Osmanthus	1					Y	Y*	Y	Y	Y		FS PS SH	4.5-7.0	4	12-25 x 10-18, rounded, upright	Nearly as hardy as holly osmanthus; dark green, full and dense leaves; good for screening, borders, hedges or formal specimen
<i>Photinia xfraseri</i>	Fraser Photinia (‘Red Tip’)	1					Y	Y*		Y	Y		FS PS SH	4.5-7.5	4	10-18 x 7-15, rounded upright	Distinctive red new growth; good screen and hedge; cold damage, insect, and disease issues, especially in moist, humid weather; flowers foul-smelling; limit use
<i>Photinia glabra</i>	Japanese Photinia	1					Y	Y*		Y	Y		FS PS SH	4.5-7.5	4	10-12, rounded, upright	Smallest Photinia; new growth red; unpleasant flower smell; less cold-hardy than Fraser and Chinese Photinias

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<i>Photinia serratifolia</i> (formerly <i>P. serrulata</i>)	Chinese Photinia	1					Y	Y*		Y	Y		FS PS SH	4.5-7.5	4	20-30 x 13-20, rounded upright	Good screen and hedge; cold damage; insect and disease issues; flowers foul-smelling; limit use
<i>Platycladus orientalis</i> (formerly <i>Thuja orientalis</i>) ‘Aurea Nana’ (‘Berckman’s Golden Arborvitae’), ‘Beverly Hills’ ‘Elegantissima’, ‘Filiformis Aurea’, others	Oriental Arborvitae (yellow to golden, medium-tall cultivars)	1					Y	Y		Y	Y		FS PS	5.5-7.4	8💧	6-12 (18) x 4-12, depending on cultivar, fine-textured, pyramidal-to-upright oval	Prefers well-drained soils, but is tolerant of most soils; less appealing to deer than <i>Thuja occidentalis</i> ; yellow to golden leaves; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Platycladus orientalis</i> ‘Baker’, ‘Blue Cone’, ‘Fruitlandii’, ‘Green Cone’, others	Oriental Arborvitae (blue-green to green, medium-tall cultivars)	1					Y	Y		Y	Y		FS PS	5.5-7.4	8💧	6-12 (18) x 4-12, depending on cultivar, fine-textured, pyramidal-to-upright oval	Same as above but with blue-green to green leaves; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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<i>Prunus laurocerasus</i>	English Laurel	1					Y	Y*		Y	Y		FS PS SH	5.5-6.5	4	10-18 x 8-20, rounded	Use species for understory planting; good hedge or specimen; intolerant of poor drainage; “shothole bacterium,” dieback common
<i>Thuja occidentalis</i> ‘Emerald’ (‘Smaragd’)	Eastern or American Arborvitae, Whitecedar	1					Y	Y*	Y	Y	Y		FS PS	6.2-7.0	1	10-16 x 3-5, narrow, upright, conical	Prefers moist, fertile, well-drained soils; pH-adaptable; reportedly needs weekly watering in dry conditions; species as a whole is not well-suited to the South; some cultivars perform better than others
<i>Thuja orientalis</i> (see <i>Platycladus orientalis</i>)	Oriental Arborvitae																
<i>Thuja plicata</i> ‘Green Giant’	‘Green Giant’ Western Arborvitae	1					Y	Y*	Y	Y	Y		FS PS	6.2-7.4	5	20-40 x 8-15, upright, dense, fine-textured	Prefers moist, fertile, well-drained soils; pH-adaptable; reportedly does not do well in dry conditions; species as a whole is not well-suited to the South; must be maintained between 10 and 20 feet to use in this category

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

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			Rural / Suburban Tiers	Urban Tier	Compact Neighborhood/ Downtown Tiers	Under Power Lines				Constructed	Solid Hedge	Riparian					
<i>Viburnum awabuki</i> ‘Chindo’	‘Chindo’ Viburnum	1					Y	Y*		Y	Y		FS PS	4.5-6.6	4	10-20 x 6-15, upright, pyramidal	Similar to ‘Nellie R. Stevens’ holly, bigger leaves; large, pendulous fruit clusters if cross-pollinated; protect from wind, cold, and winter sun; fragrant, showy flowers; deer resistant

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Table 2A: Allowed Shrubs, Evergreen, Native to NC Piedmont

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Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Chamaecyparis thyoides</i> ‘Andelyensis’, ‘Andelyensis Meth Dwarf’, ‘Andelyensis Nana’, ‘Compacta’, ‘Compacta Glauca’, ‘Heatherbun’, ‘Nana’, ‘Purple Heather’, ‘Pygmaea’, ‘Shiva’ (‘Fanfare’)	Atlantic Whitecedar (dwarf cultivars)	Y*				Y		Y	FS	5.5-6.8	9💧	6-10 x 4-10, form varies depending on cultivar	Zones 4-9; wet areas, swamps, needles turn brown second year but persist; many cultivars; not for shade; lower-growing cultivars are usually slow-growing and may eventually get taller than 10 feet; these cultivars have not proven to be drought-resistant
<i>Cyrilla racemiflora</i>	Swamp Cyrilla, Leatherwood	Y*				Y		Y	FS PS	5.5-6.2	6	10-25 x 10-15, sprawling, rounded	Zone 6+; prefers wet areas, next to ponds, lakes; semi-evergreen; large shrub or small tree
<i>Gelsemium rankinii</i>	Swamp Jessamine	Y*	Y	Y	Y	Y			FS PS	5.5-7.4	9💧	10-20 as climbing vine; 2-4 as ground-cover	Zones 7-9; all parts are poisonous, use as a vine or groundcover; non-fragrant, fall, winter, and spring flowers
<i>Gelsemium sempervirens</i>	Carolina Yellow Jessamine	Y*	Y	Y	Y	Y			FS PS	5.5-7.4	9💧	10-20 as climbing vine; 2-4 as ground-cover	Zones 6-11; all parts are poisonous; use as a vine or groundcover; fragrant, yellow, early spring flowers

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Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵			
						Constructed	Solid Hedge	Riparian						
<i>Hypericum densiflorum</i>	Dense St. Johnswort		Y			Y			FS	6.2-7.4	7💧	4-6 x 3-4, upright, oval	Zones 5-8; semi-evergreen; taller than broad; twiggy; ‘Creel’s Gold Star’ is a small shrub and may do better in Zone 7	
<i>Hypericum frondosum</i>	Golden St. Johnswort		Y	Y		Y			FS	6.2-7.4	7💧	3-4 x 3-4, upright, rounded	Zones 5-8; semi -evergreen; stout stems with exfoliating, brown bark; ‘Sunburst’ lower-growing than the species and superior to the species in the heat, humidity, and poorly-drained soils of the Southeast	
<i>Hypericum prolificum</i>	Shrubby St. Johnswort		Y	Y					FS	6.2-7.4	7💧	1-4 x 1-4, dense, rounded, spreading	Zones 4-8; semi-evergreen; upright, stiff stems; most Hypericum species do not last long in local conditions (heat, humidity, and poorly-drained soils)	
<i>Ilex glabra</i> ‘Georgia Wine’, ‘Green Billow’	Inkberry Holly (low-growing cultivars)	Y*	Y	Y	Y	Y		Y	FS PS	5.5-6.8	9💧	2-3 x 6-7, spreading	Zones 5-10; good in wet areas and swamps; ‘Green Billows’ about 18 inches tall, but not in commercial production	
<i>Ilex glabra</i> ‘Nigra’, Nordic® (‘Chamzin’), ‘Shamrock’	Inkberry Holly (compact cultivars)	Y*	Y		Y	Y		Y	FS PS	5.5-6.8	9💧	3-5 x 3-4, compact, upright rounded	Zones 5-10; often thins on lower half; good in wet areas and swamps	
<i>Ilex glabra</i> ‘Cape Cod’, ‘Compacta’, f. <i>leucocarpa</i> (‘Leucocarpa’), ‘Viridis’	Inkberry Holly (tall cultivars)	Y*	Y		Y	Y		Y	FS PS	5.5-6.8	9💧	5-10 x 4-6, taller form, upright, rounded	Zones 5-10; potential for solid hedges, fence screening; good in wet areas and swamps	

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
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Table 2A: Allowed Shrubs, Evergreen, Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Ilex vomitoria</i> Bordeaux™ (‘Condeaux’), ‘Carolina Ruby’ (‘Stephens Compact’), ‘Nana’ (‘Dwarf’), ‘Schillings’ (‘Stokes Dwarf’)	Dwarf Yaupon Holly (dwarf cultivars)	Y	Y	Y	Y	Y		Y	FS PS	5.5-6.8	8💧	2-5 x 3-8, rounded, mounding cushion	Zones 7-10; low-growing cultivars; adaptable in very dry to wet conditions; tolerates salt spray; tolerates pruning; many uses
<i>Itea virginica</i> ‘Henry’s Garnet’, Little Henry™ (‘Sprich’), ‘Long Spire’, ‘Merlot’, others	Virginia Sweetspire	Y	Y			Y		Y	FS	5.5-6.8	9💧	3-4 (6) x 4-6+, erect, twiggy	Zones 5-9; may form large, dense colonies in wet or moist soils; some drought-tolerance; fragrant flowers, red fall color, evergreen to semi-evergreen
<i>Juniperus virginiana</i> ‘Blue Cloud’, ‘Grey Owl’, ‘Kosteri’, ‘Silver Spreader’, others	Eastern Redcedar (low-growing cultivars)	Y	Y			Y			FS	5.5-7.4+	7💧	3-6 x 4-8, wide-spreading, feathery, horizontal	Zones 3-9; tolerant of poor, dry, rocky and urban soils, but does best in deep loamy soils with good drainage; ‘Kosteri’ spreads up to 25-30 feet
<i>Kalmia latifolia</i> ‘Firecracker’, ‘Little Linda’, ‘Minuet’, ‘Royal Dwarf’, ‘Tiddly Winks’ (f. <i>myrtifolia</i> x ‘Pink Charm’), ‘Tinkerbell’, others	Mountain Laurel (dwarf cultivars)	Y*			Y	Y		Y	FS PS	5.5-6.2	7💧	1.5-3 x 1.5-3, rounded, symmetric al when young, irregular with age	Zones 4-9; prefers acid, cool, moist, well-drained soil; best on steep, north-facing stream banks where used in riparian buffers; fibrous roots make these relatively easy to root; drought-tolerant when given preferred growth conditions

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Table 2A: Allowed Shrubs, Evergreen, Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Kalmia latifolia</i> ‘Bullseye’, ‘Carol’, ‘Carousel’, ‘Elf’, ‘Galaxy’, ‘Keepsake’, ‘Madeline’, ‘Myrtifolia’ (f. <i>myrtifolia</i>), ‘Peppermint’, ‘Red Bandit’, others	Mountain Laurel (compact, medium-height cultivars)	Y*			Y	Y		Y	FS PS	5.5-6.2	7💧	4-10 x 4-10 in 10 years, rounded, symmetric al when young, irregular with age	Same as above
<i>Leucothoe axillaris</i>	Coastal Leucothoe, Dog-Hobble	Y*			Y	Y		Y	PS SH	5.5-6.2	1	2-4(6) x 3-6, graceful, drooping, arching, zigzag branches	Zones 5-8; prefers acid, moist, well-drained, organic soil; not for drought; part or full shade and good drainage
<i>Leucothoe fontanesiana</i> ‘Girard’s Rainbow’, others	Drooping Leucothoe, Dog Hobble, Fetterbush	Y*			Y	Y			PS SH	5.5-6.2	1	3-6 x 3-6, graceful, drooping, arching	Same as above
<i>Rhododendron carolinianum</i> (see <i>R. minus</i>)	Carolina or Piedmont Rhododendron												
<i>Rhododendron catawbiense</i>	Catawba Rhododendron (species and cultivars)	Y*			Y	Y			PS SH	5.5-6.2	1	4-10+ x 5-8, rounded, large leaves, full	Zones 4-8; needs acid, moist, well-drained soil, winter sun protection (north-facing slopes, foundations best); locally-grown cultivars best

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

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Table 2A: Allowed Shrubs, Evergreen, Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Rhododendron maximum</i>	Rosebay Rhododendron	Y*				Y			PS SH	5.5-6.2	1	5-20 x 4-10, loose, open, multi-stemmed	Zones 3-7; needs acid, moist, well-drained soil, winter sun protection; prefers north-facing slopes of mountain streams; found along parts of the Flat River; large shrub to small tree
<i>Rhododendron minus</i> (formerly <i>R. carolinianum</i>)	Carolina or Piedmont Rhododendron	Y*			Y	Y			PS SH	5.5-6.2	1	3-6 x 3-8, rounded, often open	Zones 4-8; needs acid, moist, well-drained soil, winter sun protection; locally-grown cultivars best
<i>Thuja occidentalis</i> ‘Golden Globe’, ‘Hetz Midget’, ‘Rheingold’	Eastern or American Arborvitae, White Cedar(small cultivars)	Y	Y			Y			FS PS	6.2-7.0	1	2.5-5 x 2.5-5, dense, full, rounded pyramidal, flat sprays	Zones 3-7; not as vigorous in the South; some cultivars perform better than others
<i>Thuja occidentalis</i> ‘Filiformis’, ‘Holmstrup’	Eastern or American Arborvitae, White Cedar (medium cultivars)	Y	Y			Y			FS PS	6.2-7.0	1	6-10 x 3-15, depending on cultivar; dense, full	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Vaccinium crassifolium</i> ‘Wells Delight’, ‘Bloodstone’ (V. crassifolium subsp. sempervirens)	Creeping Blueberry	Y*		Y*					PS SH	4.5-5.5	4	0.5-0.75 x 3-5, low-growing, spreading, evergreen ground-cover	Zones 7-8; needs well-drained (sand), acidic soil with strong organic content; susceptible to <i>Phytophthora</i> root rot and stem <i>Anthraxnose</i> in less than excellent drainage; no edible fruit

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⁵ Wet/Dry and Soil Tolerance - see Figure 6, Plant Table Key, on page 37;






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Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont

Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Abelia</i> ‘Edward Goucher’ (<i>A. xgrandiflora</i> x <i>A. parvifolia</i> (<i>A. schumanii</i>))	‘Edward Goucher’ Abelia	Y	Y	Y	Y	Y			FS PS	5.0-6.5	7 	5 x 5 usually	Zones 6-9; more showy than <i>A. xgrandiflora</i> , but less cold-hardy; may also be known as “Dwarf”, ‘Dwarf Pink’, or ‘Dwarf Purple’; draws bees and butterflies
<i>Abelia xgrandiflora</i> Confetti™ (‘Conti’), ‘Kaleidoscope’, ‘Little Richard’, Mardi Gras™, others	Glossy Abelia (low-growing cultivars)	Y	Y	Y	Y	Y			FS PS	5.0-6.5	7 	1.5-3.5 x 2.5-4 (up to 8 x 8), rounded, dense, spreading	Zones 6-9; semi-evergreen in cold winters; draws bees and butterflies; occasional pruning of shoots needed
<i>Abelia xgrandiflora</i> ‘Plum Surprise’	Glossy Abelia (weeping cultivars)	Y	Y	Y	Y	Y			FS PS	5.0-6.5	7 	3 x 5, weeping,-arching-spreading mound, fine-textured	Same as above
<i>Abelia xgrandiflora</i> ‘Compacta’, ‘Francis Mason’, ‘John Creech’, ‘Sherwoodii’ (‘Sherwood’), ‘Rose Creek’, others	Glossy Abelia (medium-height cultivars)	Y	Y		Y	Y			FS PS	5.0-6.5	7 	3-4+ x 3-6, rounded, dense, spreading	Same as above

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Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Abelia xgrandiflora</i> ‘Lavender Mist’, ‘Raspberry Profusion’	Glossy Abelia (medium-tall cultivars)	Y	Y*		Y	Y			FS PS	5.0-6.5	7💧	4.5-5+ x 6-10, rounded, dense, spreading	Same as above
<i>Abelia chinensis</i>	Chinese Abelia	Y*	Y	Y	Y	Y			FS PS	5.5-6.8	7💧	5-7 x 4-5, upright, spreading	Zones 6-9; large; white flowering; semi-evergreen; bees and butterflies
<i>Agarista populifolia</i> (formerly <i>Leucothoe populifolia</i>)	Florida Leucothoe	Y*			Y	Y		Y	PS SH	4.5-6.2	4	8-12 x 4-8, drooping, arching, multi-stemmed	Zones (6)7-9; more tolerant of diseases and conditions than <i>L. fontanesiana</i> or <i>L. axillaris</i> ; can be maintained at smaller, shrub height with pruning; needs, cool, moist, environment; prefers acid, high-organic-content soil, shade; good along steams; tends to form suckering communities
<i>Aspidistra elatior</i>	Cast-Iron Plant	Y*	Y	Y	Y	Y			PS SH	6.2-6.8	7💧	1.5-2.5 x 2-3, upright, coarse texture	Zones (7)8-9; large-leaf groundcover or edging plant along shady sidewalks; prefers full shade to part shade; needs deep, rich, well-drained soil for good drought-tolerance; leaf edges turn brown in winter unless well-protected and well-suited
<i>Aucuba japonica</i> ‘Cecil-Alice’, ‘Marmorita’, ‘Nana’ (‘Variegata Nana’), ‘Nana Compacta’, ‘Nana Cuspidata’, ‘Natso-No-Kumo’, others	Japanese Aucuba, Spotted Laurel (lower-growing, variegated cultivars)	Y*			Y*	Y*			PS SH	5.4-6.8	7💧	6-10 x 4-8, broad leaf, dense, upright, rounded	Zones 7-10; prefers moist, high-organic, well-drained soil, but tolerant of a mix of soils; prefers full shade and can grow in dry shade under heavy tree canopy; location of use is predicated on the mature or maintained height of the plant or cultivar

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Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Aucuba japonica</i> ‘Emily Rose’, ‘Hillieri’, var. <i>himalaica</i> , ‘Honshu’ (var. <i>borealis</i>), ‘Longifolia’ (var. <i>longifolia</i>), ‘Pink Champagne’, ‘Rozannie’, ‘Sea of Japan’ (var. <i>borealis</i>), others	Japanese Aucuba, Spotted Laurel (lower-growing, green-leafed cultivars)	Y*			Y*	Y*			PS SH	5.4-6.8	7💧	6-10 x 4-8, broad leaf, dense, upright, rounded	Same as above
<i>Aucuba japonica</i>	Japanese Aucuba, Spotted Laurel (species and taller cultivars)	Y*			Y*	Y*			PS SH	5.4-6.8	7💧	6-10(15) x 4-8, broad leaf, dense, upright, rounded	Same as above
<i>Berberis julianae</i>	Wintergreen Barberry	Y			Y	Y			FS PS	6.2-6.8	7💧	6-10 x 6-10, rounded, impenetrable mass	Zones 6-8; a barrier plant with thorns; does not prune well; cut to six inches above ground to rejuvenate as needed
<i>Berberis xgladwynensis</i> ‘William Penn’	William Penn Barberry	Y			Y	Y			FS PS	5.5-6.8	8💧	3-4 x 3-4, dense, rounded	Zones 7-9; does best with moist, well-drained soil, but tolerates poor soils; a barrier plant; not widely available
<i>Berberis xmentorensis</i> (<i>B. julianae</i> x <i>B. thunbergii</i>)	Mentor Barberry	Y			Y	Y			FS PS	5.5-6.8	8💧	5-7 x 5-7(12), upright, stiff, rounded, spreading with age	Zones 7-9; semi-evergreen; does best with moist, well-drained soil, but tolerates poor soils; a dense barrier plant if not pruned extensively; not widely available

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Buxus microphylla</i> var. <i>japonica</i>	Japanese Boxwood	Y	Y	Y	Y	Y			FS	6.8-7.5+	8💧	3-4 x 3-4, loose, rounded, formal	Zones 6-9; slow growing; needs high pH; a surface-rooter, so keep mulched and do not cultivate around base of plant; takes pruning; good for hedges, edging, formal gardens, urban planting, if maintained; deer-resistant, but some diseases
<i>Buxus microphylla</i> var. <i>koreana</i> (see <i>B. sinica</i> var. <i>insularis</i>)	Korean Boxwood												
<i>Buxus sempervirens</i> ‘Suffruticosa’	English Boxwood, “True Edging” Boxwood	Y	Y	Y	Y	Y			FS PS	6.0-7.4	8💧	2-4 x 3-5, dense, formal; if left alone, like ‘fused clouds’	Zones (5)6-8; cold-hardiness depends on cultivar; not as slow-growing as Japanese boxwood; very long-lived in ideal conditions; takes pruning; surface-rooter, so keep mulched and do not cultivate around base of plant; does best in rich, well-drained, limestone soils; heavy soils (local Triassic clay) increases stress and nematode damage; deer-resistant; some issues with “English Boxwood decline” in Zone 6
<i>Buxus sempervirens</i> ‘Blauer Heinz’, Gordo™ (‘Conrowe’), ‘Myrtifolia’, ‘Nela Park’, ‘Newport Blue’, ‘Rosmarinifolia’, ‘Welleri’	Common Box or Boxwood (lower-growing cultivars)	Y	Y		Y	Y			FS PS	6.0-7.5+	8💧	2-5 x 4-5, dense, rounded, formal	Same as above

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<i>Buxus sempervirens</i> ‘Asheville’, ‘Bullata’ (‘Latifolia Bullata’), ‘Dee Runk’, ‘Elegantissima’, ‘Liberty’, ‘Pullman’, ‘Rotundifolia’	Common Box or Boxwood (medium-height cultivars)	Y	Y		Y	Y			FS PS	6.0-7.4	8💧	5-10 x 4-10, dense, shape varies by cultivar, formal	Same as above; ‘Asheville’, ‘Elegantissima’ are pyramidal; ‘Dee Runk’, ‘Liberty’ are narrow, columnar-pyramidal
<i>Buxus sempervirens</i> ‘Aurea-pendula’, ‘Pendula’	Common Box or Boxwood (medium-height, weeping cultivars)	Y	Y		Y	Y			FS PS	6.0-7.4	8💧	6-10 x 6, weeping,	Same as above, but weeping forms; large shrub or small tree
<i>Buxus sinica</i> var. <i>insularis</i> (formerly <i>B. microphylla</i> var. <i>koreana</i>)	Korean Boxwood	Y	Y	Y	Y	Y			FS PS	5.4-6.8	8💧	2-3 x 3-6, dense, rounded, becoming loose, open, spreading	Zones 4-9; extremely cold-hardy compared to other boxwoods; slow growing; prefers high pH; a surface-rooter, so keep mulched and do not cultivate around base of plant; takes pruning; good for hedges, edging, formal gardens, urban planting, if maintained; deer-resistant, but some diseases
<i>Calluna vulgaris</i> ‘Amethyst’, many others	Scotch Heather	Y*		Y*					FS	5.5-6.2	4	0.33-2 x 2+, low ground-cover	Zones 4-7; does better in the North; needs sandy, organic, acidic, moist (but not wet) soil that has PERFECT drainage; avoid sweeping winds; will grow in part shade, but flowering is not as profuse; plant as specimen; flowers attract bees from July to September

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Calocedrus decurrens</i> (formerly <i>Libocedrus decurrens</i>) ‘Compacta’	‘Compacta’ California Incensecedar	Y*				Y			FS	6.2-6.8	7 	6 x 6, globe	Zones 5-8; prefers moist, well-drained, fertile soil, but tolerant of many soil types; intolerant of smog, pollution, and high wind areas; once established, is drought- and heat-tolerant
<i>Calocedrus decurrens</i> ‘Maupin Glow’	‘Maupin Glow’ California Incensecedar	Y*				Y			FS	6.2-6.8	7 	8-15 x 4-5, columnar	Same as above;
<i>Camellia japonica</i>	Japanese Camellia	Y			Y	Y	Y*		PS	5.5-6.0	4	10-15(25) x 6-10, densely pyramidal, sometimes more open, formal, stiff	Zones 6-9; prefers moist, acid, high organic content, well-drained soils; high Pine shade best; shallow-rooted, so mulch and do not cultivate around base; bloom January-April, depending on cultivar; numerous cultivars with different color blooms, some double; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Camellia oleifera</i>	Tea-Oil Camellia	Y			Y	Y			FS PS	5.5-6.0	4	12-15 x 8-12, pyramidal-to-rounded; multi-stem	Zones 6-9; culture similar to <i>C. japonica</i> and <i>C. sasanqua</i> ; blooms October to January; hardier than other camellias (look for Ackerman Hybrids); less formal than other camellias; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Camellia sasanqua</i>	Sasanqua Camellia (lower-growing cultivars)	Y	Y*		Y	Y	Y*		PS	5.4-6.2	4	6-10 x 6-10, densely-branched, pyramidal to round	Zones 6-9; smaller leaf, and more refined and open than <i>C. japonica</i> ; culture similar to <i>C. japonica</i> ; hardier than <i>C. Japonica</i> ; blooms September to December; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Camellia sinensis</i>	Tea	Y			Y	Y			FS PS SH	5.4-6.8	7💧	4-8(10) x 4-6, rounded shrub	Zones 6-9; hardiest of Camellias; not as particular about soil or sun exposure – will tolerate full sun or heavy shade; good drought- and heat-tolerance; blooms September to November; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Cedrus deodara</i> ‘Feelin Blue’, ‘Snow Sprite’	Dwarf Deodar Cedar	Y	Y*						PS	6.2-7.4	7💧	4-6(10) x 4-6, dwarf, pyramidal	Zones 7-9; requires well-drained and somewhat dryer soils in part shade due to the heat; protect from winter winds; drought-tolerant once established; specimen plantings; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Cephalotaxus harringtonia</i> ‘Duke Gardens’, ‘Fritz Huber’, ‘Gnome’, ‘Pedunculata’, ‘Prostrata’ (var. <i>prostrata</i>)	Plum Yew (lower-growing, spreading cultivars)	Y	Y	Y	Y	Y			FS PS SH	5.8-7.4	7💧	2-3 x 4-10, dense, spreading	Zones 6-9; prefers moist, well-drained soils, but is adaptable and drought-tolerant once established; can take full sun; deer resistant

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


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<i>Cephalotaxus harringtonia</i> ‘Nana’ (var. <i>nana</i>), ‘Scott Wallace’, Yewtopia™	Plum Yew (medium-height, spreading cultivars)	Y	Y		Y	Y			FS PS SH	5.8-7.4	7 	3-6 x 6-15, dense, spreading	Same as above
<i>Cephalotaxus harringtonia</i> ‘Fastigiata’	Upright Plum Yew	Y	Y		Y	Y			FS PS SH	5.8-7.4	7 	8-10 x 6-8, upright, somewhat columnar	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Chamaecyparis obtusa</i> ‘Nana’, ‘Nana Gracilis’, ‘Pygmaea Aurescens’	Dwarf Hinoki Falsecypress	Y			Y	Y			FS	5.5-6.8	4	2-6 x 2-4, dense, pyramidal	Zones 4-8; prefers moist, well-drained soil, and humid atmosphere; water weekly or more often in extreme heat; specimen plantings; protect from winter wind; deer resistant
<i>Chamaecyparis pisifera</i> ‘Golden Mop’, ‘Lemon Yellow’	Dwarf Threadleaf Falsecypress (yellow and golden cultivars)	Y				Y			FS	5.5-6.5	4	2-3 x 2, dense habit, arching branchlets	Same as <i>C. obtusa</i> , above
<i>Chamaecyparis pisifera</i> ‘Squarrosa Minima’, ‘Squarrosa Pygmaea’	Dwarf Moss Falsecypress (low-growing, blue cultivars)	Y				Y			FS	5.5-6.5	4	2-3 x 2, dense, globose to irregularly fluffy	Same as above; can shear annually to maintain shape and fullness
<i>Chamaecyparis pisifera</i> ‘True Blue’	Dwarf Sawara Falsecypress (low-growing, blue cultivars)	Y				Y			FS	5.5-6.5	4	2-3 x 2, dense, upright-pyramidal	Same as above; can shear annually to maintain shape and fullness

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<i>Chamaecyparis pisifera</i> ‘Baby Blue’, Soft Serve® ('Dow Whiting')	Dwarf Sawara Falsecypress (medium height cultivars)	Y				Y			FS	5.5-6.5	4	6-10 x 4-8, upright, dense, pyramidal	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Chamaecyparis pisifera</i> ‘Vintage Gold’	Dwarf Sawara Falsecypress (low-medium height, gold cultivar)	Y				Y			FS	5.5-6.5	4	5-7 x 3-5, upright, globose	Same as above
<i>Chamaecyparis pisifera filifera</i> ‘Golden Charm’, ‘Sungold’	Dwarf Threadleaf Falsecypress (low-medium height, gold cultivars)	Y				Y			FS	5.5-6.5	4	5-6 x 7-8, upright, compact, pyramidal	Same as above
<i>Clematis armandii</i>	Armand Clematis	Y							FS PS	5.5-7.4	4	2-4 ground-cover or 10-20+ x 30 climbing vine	Zones 7-9; prefers cool, moist, well-drained soils; best if bottom of plant is cool and shaded, with top in full sun
<i>Cotoneaster adpressus</i> ‘Tom Thumb’	Creeping Cotoneaster (species and cultivars)	Y*	Y*	Y*					FS PS	5.5-7.4	7💧	1-3 x 4-6, dwarf, compact, spreading	Zones 4-7; tough once established; salt-tolerant; prefers well-drained, moist soils; lace bug, fireblight, aphids and mites a problem, especially in the South (all Cotoneasters)

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
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<i>Cotoneaster dammeri</i>	Bearberry Cotoneaster (species and cultivars)	Y*	Y*	Y*					FS PS	5.5-7.4	4	1-3 x 4-6, dwarf, compact, spreading	Zones 5-8; otherwise the same as <i>C. adpressus</i> , but needs to be replaced after 4-6 years (does not age well)
<i>Cotoneaster horizontalis</i>	Rockspray Cotoneaster (species and cultivars)	Y*	Y*	Y*					FS PS	5.5-7.4	7💧	1-3 x 4-6, dwarf, compact, spreading	Same as <i>C. adpressus</i>
<i>Cotoneaster lacteus</i> (formerly <i>C. parneyi</i> , <i>C. coriacus</i>)	Parney Cotoneaster	Y*	Y*		Y*	Y*			FS PS	5.5-7.4	7💧	6-10 x 5-9, upright, rounded, spreading	Zones 6-8; tough once established; salt-tolerant.; prefers well-drained soils; more tolerant of Southern pests and conditions
<i>Cotoneaster lucidus</i> (<i>C. acutifolius</i> var. <i>lucidus</i>)	Hedge Cotoneaster	Y*	Y*		Y*	Y*			FS PS	5.5-7.4	7💧	6-10 x 6-10, erect, rounded	Same as <i>C. horizontalis</i>
<i>Cotoneaster salicifolius</i> ‘Autumn Fire’ (‘Herbstfeuer’), Emerald Carpet™ (‘Green Carpet’), ‘Gnom’ (‘Gnome’), ‘HQ’, ‘Parkteppich’, ‘Repens’ (‘Repandens’, ‘Avondrood’, ‘Dortmund’), ‘Saldam’, ‘Scarlet Leader’	Willowleaf Cotoneaster (low-growing, groundcover cultivars)	Y*	Y*	Y*					FS PS	5.5-6.8	7💧	1-3 x 6-10+, wide-spreading ground-cover	Zones 6-7; otherwise the same as <i>C. adpressus</i> , gets rougher-looking with age; deer resistant

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<i>Cotoneaster salicifolius</i>	Willowleaf Cotoneaster (species and taller cultivars)	Y*			Y	Y			FS PS	5.5-6.8	7💧	10-15 x 6-10, upright, rangy, arching	Same as above
<i>Cryptomeria japonica</i> ‘Elegans Nana’, ‘Jindai’, ‘Lobbii Nana’, ‘Osaka Tama’, ‘Pom Pom’, ‘Tansu’, others	Japanese Cedar (dwarf cultivars)	Y*	Y*	Y*		Y*			FS	5.5-6.2	5	2-6 x 2-6, dwarf, mounding	Zones 6-8; needs deep, rich, well-drained soil with dependable moisture, and protection from wind for best growth; withstands heat well; more of a specimen plant; slow growth rate
<i>Cryptomeria japonica</i> ‘Black Dragon’, Chapel View™, ‘Dense Jade’	Japanese Cedar (mid-size cultivars)	Y	Y			Y	Y		FS	5.5-6.2	5	6-10 x 4-7, depending on cultivar; upright, pyramidal	Same as above, except good as a specimen, or in groups, and for screening; tip and stem dieback are problems; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Daphne odora</i> (and other <i>Daphne</i>)	Winter Daphne (and other Daphne)	Y*			Y	Y			PS SH	5.5-7.0	4	1-4 x 2-5, depending on species or cultivar, rounded	Zones 4-7; needs well-drained soil and regular (but not standing) moisture; temperamental and will die for no apparent reason; very fragrant; recommend specimen plantings only
<i>Daphniphyllum macropodum</i> (formerly <i>D. himalense</i> subsp. <i>macropodum</i>)	Daphniphyllum	Y*			Y	Y			FS PS	5.5-6.8	4	12-20 x 12-20; full to ground, rounded	Zones 6-9; prefers well-drained soils rich in organic content; leggy in shade; foliage effect like Rhododendrons

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<i>Elaeagnus xebbingei</i> (<i>E. macrophylla</i> x <i>E. pungens</i>)	Elaeagnus, Ebbinge’s Silverberry	Y	Y		Y	Y			FS PS	5.5-7.5	8 	8-10 x 8-10, wild, rounded, thorny	Zones 7-11; fast-growing; very adaptable to soils and exposure; the only <i>Elaeagnus</i> permitted (others are invasive); salt- and pollution-tolerant; white, fragrant flowers October to January; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Euonymus japonicus</i> ‘Microphyllus’, ‘Rykujo’, others	Japanese Euonymus (dwarf cultivars)	Y	Y	Y	Y				FS PS SH	5.5-7.5	8 	1-3 x 1-3, low, upright-growing, stiff, rounded	Zones 7-9; adaptable to soil and exposure; salt-tolerant; can be decimated by aphids, white fly, scale, mildew, scab and other diseases, and deer love it; some cultivars are variegated
<i>Euonymus japonicus</i>	Japanese Euonymus (tall cultivars)	Y	Y		Y	Y			FS PS SH	5.5-7.5	8 	5-10 x 3-6, stiff, upright, rounded	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Euonymus kiautschovicus</i> ‘Manhattan’, others	Spreading Euonymus (taller cultivars)	Y	Y		Y	Y			FS PS	5.5-7.5	8 	8-10 x 10-12, rounded	Zones 5-8; adaptable to soils and exposure; salt-tolerant; has the typical <i>Euonymus</i> pest problems; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Gardenia jasminoides</i> ‘Radicans’ (‘Prostrata’), ‘White Gem’, others	Dwarf Gardenia (dwarf cultivars)	Y	Y	Y	Y				FS PS	5.5-6.2	4	1-3 x 2-5, low-growing, spreading	Zones 7-10; same as for larger gardenias

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
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<i>Gardenia jasminoides</i>	Cape Jasmine, Gardenia	Y	Y*		Y	Y			FS PS	5.5-6.2	4	4-8(10) x 4-10, dense, rounded	Zones 7-10; best performance with winter protection from sun and wind; needs acid, moist, well-drained soils; recommend using the more cold-hardy cultivars, such as ‘Billie Holliday’, ‘Chuck Hayes’, and others; tough once established; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Iberis sempervirens</i>	Candytuft	Y*	Y*	Y*	Y*				FS PS	5.5-7.4	7💧	0.5-1 x 2-3, low, dense, ground-cover	Zones 4-9; prefers loose, loamy, well-drained soil
<i>Ilex xattenuata</i> ‘Fosteri’ Dixie Star™ (‘Xia Yen’), others	Dixie Star™ Hybrid Holly	Y	Y			Y	Y		FS PS	5.5-7.4	7💧	6-10 x 6, upright, open when young	Zones 6-8; prefers loose, loamy, well-drained soils, but is adaptable; good specimen holly; other Dixie Series hybrid hollies must be pruned to maintain as shrubs; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Ilex cornuta</i> ‘Carissa’, ‘Rotunda’	Chinese Holly (low-growing cultivars)	Y	Y			Y			FS PS	5.5-7.4	8💧	3-4(6) x 4-8, compact, dense, mounding	Zones 7-9; tolerant of soil, pH, exposure, heat and drought; spiny foliage; less cold-hardy than ‘Dwarf Burford’

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<i>Ilex cornuta</i> Berries Jubilee™ ('Greer') 'Burfordii', 'D'Or', 'Dazzler', 'Dwarf Burford' ('Burfordii Nana', 'Burfordii Compacta'), 'Fineline' ('Fine Line'), 'Needlepoint' ('Anicet Delcambre', 'Willowleaf'), others	Chinese Holly (medium-tall cultivars)	Y	Y*			Y	Y		FS PS	5.5-7.4	8💧	6-10(20) x 6-20 (depends on pruning and form wanted), dense, bushy, rounded	Same as above, but some cultivars are more cold-hardy than the lower-growing cultivars; can maintain as a pruned shrub or hedge, or grow into small tree; ; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Ilex crenata</i> 'Carefree', 'Helleri', 'Hoogendorn', 'Hoogendorn Variegated', 'Repandens', 'Soft Touch', 'Stokes', 'Tiny Tim', others	Japanese Holly (low-growing cultivars)	Y	Y	Y*					FS PS	6.2-7.4	4	2-4 x 3-6, dense, rounded-spreading	Zones 5-8; prefers light, moist, well-drained, slightly acid soils; withstands hard pruning, but not often needed if using the right variety for the space provided; susceptible to spider mites, nematodes, root rot, especially with stress (wet, clay soils); 'Carefree' prefers part shade
<i>Ilex crenata</i> 'Compacta', 'Convexa', 'Drops of Gold', 'Hetzii', 'Microphylla' (f. <i>microphylla</i>), 'Rotundifolia', others	Japanese Holly (medium to tall cultivars)	Y	Y		Y	Y			FS PS	6.2-7.4	4	4-10 x 6-15+, dense, shape depends on cultivar	Same as low-growing <i>I. crenata</i> ; withstands pruning, but not needed to maintain a dense plant; potential for screens

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						Constructed	Solid Hedge	Riparian					
<i>Ilex crenata</i> ‘Cherokee’, ‘Chesapeake’, ‘Imperial’, ‘Jersey Pinnacle’, ‘Sentinel’, others	Japanese Holly (tall, pyramidal-columnar cultivars)	Y	Y		Y	Y			FS PS	6.2-7.4	4	6-10 x 4-6, upright, dense, rounded to pyramidal	Same as low-growing <i>I. crenata</i> ; withstands pruning, but not needed to maintain a dense plant; potential for screens; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Ilex crenata</i> ‘Fastigiata’, ‘Sky Pencil’ (Sky Sentry™ in Canada), Sky Pointer™ (‘Farrowone’)	Japanese Holly (upright, narrow-columnar growing)	Y	Y						FS PS	6.2-7.4	4	5-12 x 0.5-2, upright, narrow column	See low-growing <i>I. crenata</i> ; stiff stems often break or split apart; a specimen plant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Ilex</i> ‘Clusterberry’ (‘Nellie R. Stevens’ x <i>I. leucoclada</i>)	Hybrid Holly	Y	Y			Y	Y		FS PS	6.2-7.4	7💧	6-10+ x 6-10, rounded, spreading	Zones 7-9; prefers loose, loamy, well-drained soils, and full sun, but is adaptable; good specimen holly; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Illicium anisatum</i>	Japanese Anise-Tree	Y*				Y		Y	PS SH	5.5-6.8	4	6-12(15) x 6-10, dense, pyramidal	Zones 7-9; prefers moist, rich, well-drained soil, and part-shade; variably hardy in Zone 7
<i>Illicium floridanum</i>	Florida Anise-Tree	Y*			Y	Y		Y	PS SH	5.5-6.8	8💧	6-12 x 4-10, upright, dense-to-loose, usually compact	Zones 6-9; prefers moist, rich, well-drained soil, and part shade; often found in swampy areas in wild; crushed leaves smell like licorice; habit depends on amount of sun and pruning

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
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Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Illicium henryi</i>	Henry Anise-Tree	Y*	Y*			Y		Y	FS PS SH	5.5-6.8	7💧	6-15 x 4-10, dense, pyramidal	Zones 7-9; prefers moist, rich, well-drained soil; part-shade best, but also performs well in full sun; withstands heat well; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Illicium parviflorum</i>	Small Anise-Tree	Y	Y			Y		Y	FS PS SH	5.5-6.8	8💧	8-15 x 6-10, upright, pyramidal.	Zones 6-9; prefers moist, rich, well-drained soil; part-shade best, but also performs well in full sun; will form suckering colonies; found in wet areas in the wild; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Jasminum nudiflorum</i>	Winter Jasmine	Y	Y						FS PS	6.2-7.4	8💧	3-4 x 4-7+, broad-spreading, weeping mass of ground-cover	Zones 6-10; prefers well-drained soil, but does well in poor soils and slopes; roots where branches touch the ground, forming colonies—almost a weed; good urban plant; not for naturalizing (will become invasive)
<i>Juniperus chinensis</i> ‘Arctic’, ‘Golden Glow’, ‘San Jose’, var. <i>sargentii</i> , var. <i>sargentii</i> ‘Glauca’, ‘Sea Spray’, others	Chinese Juniper (low-growing, spreading cultivars)	Y	Y	Y					FS	6.2-7.4	7💧	1-2.5 x 3-8+, spreading ground-cover	Zones 4-9, depending on cultivar; prefers moist, well-drained soils, but not wet, conditions; withstands dry conditions and drought once established; pH-adaptable; some have yellow/gold foliage; after 10-15 years, many Chinese junipers get much larger than specified in literature

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						Constructed	Solid Hedge	Riparian					
<i>Juniperus chinensis</i> ‘Armstrong’, ‘Fruitlandii’, Gold Coast® (‘Aurea Improved’), ‘Gold Lace’, ‘Holbert’, ‘Milky Way’, ‘Nick’s Compact’ (‘Pfitzeriana Nick’s Compacta’), ‘Old Gold’, ‘Pfitzeriana Compacta’, others	Chinese Juniper (low to medium, spreading cultivars)	Y	Y			Y			FS	6.2-7.4	7💧	2-4 x 3-8+, spreading ground-cover, form depends on cultivar	Same as above
<i>Juniperus chinensis</i> ‘Angelica Blue’, ‘Aquarius’, ‘Blaauw’, Gold Star® (‘Bakaurea’), Mint Julep™ (‘Monlep’), ‘Pfitzeriana Aurea’, ‘Pfitzeriana Glauca’ (‘Blue Pfitzer’), ‘Saybrook Gold’, ‘Sea Green’, others	Chinese Juniper (medium height cultivars)	Y	Y			Y			FS	6.2-7.4	7💧	4-8 x 3-12+, form depends on cultivar	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Juniperus chinensis</i> ‘Hetzii Glauca’, ‘Pfitzeriana’ (‘Pfitzerana’, ‘Wilhelm Pfitzer’)	Chinese Juniper (medium to tall cultivars)	Y*	Y*			Y*			FS	6.2-7.4	7💧	8-10+ x 8-12, form depends on cultivar	Same as above

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						Constructed	Solid Hedge	Riparian					
<i>Juniperus chinensis</i> ‘Ames’, ‘Blue Point’, ‘Columnaris Glauca’, ‘Fairview’, ‘Hooks’, ‘Kaizuka’ (‘Torulosa’), ‘Obelisk’, ‘Robusta Green’, ‘Spartan’, ‘Spearmint’, ‘Story’, ‘Wintergreen’, others	Chinese Juniper (tall and narrow cultivars)	Y*	Y*			Y*	Y*		FS	6.2-7.4	7💧	8-10+ x 2-6, erect, form depends on cultivar	Same as above
<i>Juniperus chinensis</i> ‘Blue Alps’, ‘Blue and Gold’, ‘Blue Vase’, ‘Hetzii’, ‘Hetzii Columnaris’, ‘Keteleeri’, ‘Pyramidalis’, others	Chinese Juniper (tall cultivars)	Y*	Y*			Y*	Y*		FS	6.2-7.4	7💧	8-15(20) x 8-12, pyramidal to spreading, form depends on cultivar	Same as above
<i>Juniperus conferta</i> ‘Blue Pacific’, ‘Emerald Sea’, ‘Silver Mist’ (‘Shiro Toshio’)	Shore Juniper	Y	Y	Y					FS PS	6.2-7.4	7💧	1-2 x 6-9, low, trailing ground-cover	Zones 6-9; prefers well-drained soils (sand); pH-adaptable; will grow in clay soils if drainage is good (no excess moisture); salt-tolerant; will tolerate some shade better than other junipers

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<i>Juniperus davurica</i> ‘Expansa’ (‘Parsonii’)	Parson’s Juniper	Y	Y	Y					FS PS	6.2-7.4	7💧	1.5-3 x 5-9, rigid, horizontal sprays, mounding ground-cover	Zones 6-9; prefers well-drained soils, pH-adaptable; will grow in clay soils, if drainage is good; salt-tolerant; great heat-tolerance, and will tolerate some shade better than other junipers; great plant for the South
<i>Juniperus horizontalis</i> ‘Bar Harbor’, ‘Blue Chip’, ‘Wiltonii’ (‘Blue Rug’, ‘Wiltoni’), ‘Emerald Spreader’, ‘Plumosa’, ‘Plumosa Compacta’, others	Creeping Chinese Juniper	Y	Y	Y					FS	6.2-7.4	7💧	0.5-2 x 4-8, low, trailing or spreading ground-cover	Zones 4-9; Prefers well-drained soils (sandy, rocky), pH-adaptable, salt-tolerant; will grow in clay soils, if well-drained; does well in hot, dry conditions; can be seriously affected by Juniper blight
<i>Juniperus procumbens</i> ‘Nana’ (<i>J. chinensis</i> var. <i>procumbens</i>), others	Japanese Garden Juniper, Creeping Juniper	Y	Y	Y					FS	6.2-7.4	8💧	0.5-2 x 8-15, mounding, spreading ground-cover	Zones 4-7; prefers well-drained soils, but is tolerant of many soils (including chalky, calcareous soils), thriving under adverse conditions
<i>Juniperus sabina</i> Calgary Carpet™ (‘Monna’), others	Savin Juniper (very low cultivars)		Y	Y					FS	6.8-7.4+	7💧	0.5-1 x 8-10, low, trailing ground-cover	Zones 3-7; prefers well-drained, dry sites, limestone soils; not as tolerant of heat and humidity; upright shrub forms also available (2-8 feet tall) as well as other groundcover forms; species can grow to 4-15 x 5-10

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
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<i>Juniperus scopulorum</i> ‘Tolleson’s Weeping Juniper’	Weeping Rocky Mountain Juniper		Y*			Y			FS	5.5-7.5	8 	15-20 x 6-10, weeping	Zones 3-7; silver-blue foliage on arching branches for an interesting form; some success growing in as far south as Florida; ‘Tolleson’s Green Weeping’ has green foliage; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Libocedrus decurrens</i> (see <i>Calocedrus decurrens</i>)	California Incensecedar												
<i>Loropetalum chinensis</i> Carolina Moonlight® (‘NCI001’), Emerald Snow™, ‘Green Elf’, Snow Muffin® (‘Snowmound’)	Green-Leaf Loropetalum, Chinese Witch-Hazel (smaller cultivars)	Y	Y		Y	Y			FS PS	5.5-6.2	7 	1.5-4 x 4-6, depends on variety, dense, mounding	Zones 7-9; green leaf varieties; best in acid, moist, well-drained, highly-organic soils with mulch; not for high pH soils; once established, withstands drought; “smaller” varieties have a habit of out-growing size predictions but withstands pruning well
<i>Loropetalum chinensis</i> ‘Compactum’, Hillier Form, Snow Dance™	Green-Leaf Loropetalum (species and medium-height cultivars)	Y	Y		Y	Y			FS PS	5.5-6.2	7 	6-10 x 6-10, dense, irregularly rounded	Same as above; species can grow to 20 feet tall; keep as a shrub, or tree-form the larger varieties; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Loropetalum chinense</i> var. <i>rubrum</i> ‘Chang’s Ruby’ (‘Ruby’), Ever Red™ (‘Chang Nian Hong’), ‘Peack’, ‘Plaze’, Purple Pixie™ (‘Shang-lo’), Purple Diamond™ (‘Shang-hi’), ‘Sizzlin Pink’	Burgundy Loropetalum (smaller cultivars)	Y	Y		Y	Y			FS PS	5.5-6.2	7 	2-6 (12) x 4-8, dense, rounded	Zones 7-9; burgundy leaf varieties; best in acid, moist, well-drained, highly-organic soils with mulch; not for high pH soils; once established, withstands drought; “smaller” varieties have a habit of out-growing size predictions; withstands pruning well; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Loropetalum chinense</i> var. <i>rubrum</i> ‘Burgundy’ (‘Akabana’), Fire Dance™, Little Rose™ (‘GriffCRL’), Plum Delight® (‘Hines Purple Leaf’, ‘Hines Burgundy’, Pizzazz™), ‘Zhuzhou Fuchsia’ (‘Pipa’s Red’)	Burgundy Loropetalum (medium to large cultivars)	Y	Y		Y	Y	Y		FS PS	5.5-6.2	7 	6-15 x 8-15, dense, irregularly-rounded	Same as above; keep as a shrub, or prune larger cultivars into tree-form; ‘Zhuzhou Fuschsia’ seems to be the most cold-hardy cultivar; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Mahonia aquifolium</i>	Oregon Grape Holly	Y			Y	Y			PS SH	5.5-6.2	4	3-6 x 3-5, coarse, spiny, thick branches	Zones 5-9; protect from heat, dry soils and winter sun and wind (best protected by buildings in urban areas); acid, moist, well-drained soils; will sucker and form colonies, if good conditions; unusual blue berries, winter flowering
<i>Mahonia fortunei</i>	Chinese Mahonia	Y			Y	Y			PS SH	5.5-6.2	4	3-6 x 3-5, irregular texture	Same culture as <i>M. aquifolium</i> ; more graceful and less coarse than <i>M. aquifolium</i>

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
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<i>Michelia figo</i>	Banana Shrub	Y*			Y	Y			PS FS	5.5-6.2	4	6-12 x 6-12, dense, rounded	Zones 7-10; prefers well-drained, fertile, sandy loam soils; best in half-shade; fruity smelling
<i>Myrica cerifera</i>	Southern Wax Myrtle	Y	Y		Y	Y	Y		FS PS	5.5-7.4	8💧	10-15 x 10-15, somewhat open, rounded	Zones 7-11; adaptable to many soil types; grows in sand or clay; best growth in well-drained soils; salt-tolerant; will sucker and form colonies, especially in loose soils; prune to make a dense screen, or limb-up for multi-stemmed small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Myrica cerifera</i> ‘Don’s Dwarf’	Dwarf Southern Wax Myrtle	Y	Y		Y	Y			FS PS	5.5-6.8	8💧	3-6 X 3-6, rounded, spreading	Zones 7-11; tolerant of salt spray (seaside plant); grows in sand and swamps, best in fertile, moist soils; can prune to densify or tree-form; can sucker and spread
<i>Myrica heterophylla</i>	Swamp Bayberry	Y*	Y		Y	Y			FS PS	5.5-6.8	9💧	8-12 x 8-12, rounded	Zones 7-9; grows in bogs and wet areas in wild; foliage larger and denser than Southern Wax Myrtle; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Myrica pensylvanica</i>	Northern Bayberry	Y*	Y*		Y*	Y*			FS PS	5.5-7.4	8💧	5-12 x 5-12, dense, rounded, massing	Zones 3-6 (7); better plant in the North; suckers and forms colonies; semi-evergreen to deciduous; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Nandina domestica</i> ‘Atropurpurea Nana’ (‘Nana Atropurpurea’), ‘Fire Power’ (‘Firepower’), ‘Pygmaea’ (‘Minima’), ‘San Gabriel’ (‘Kurijusi’, ‘Orhime’)	Dwarf Nandina (low-growing cultivars without fruit)	Y	Y	Y	Y				FS PS SH	5.5-7.4	8 	1-3 x 2-3, upright, spreading (by slow suckering), flat top	Zones 6-9; can use other cultivars with no, or very low, berry production (invasiveness); adaptable to pH and soil types, sun and shade; best growth in moist, well-drained soils; withstands drought and abuse
<i>Nandina domestica</i> Blush™ (‘AKA’), ‘Compacta’, Sienna Sunrise™ (‘Monfar’)	Nandina (taller cultivars without fruit)	Y	Y		Y	Y			FS PS SH	5.5-7.4	8 	3-5 x 3-5, upright, spreading (by slow suckering), flat top	Same as above
<i>Osmanthus fragrans</i>	Fragrant Tea Olive	Y			Y	Y	Y		FS PS	5.5-7.4	8 	10-12(20+) x 10-12, dense rounded, full to ground	Zones 7-10; least cold-hardy Osmanthus; moist, acid, well-drained soils best, but is adaptable; most fragrant Osmanthus, flowering September to October, and into late Fall; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Osmanthus heterophyllus</i> (formerly <i>O. ilicifolius</i>)	Holly Osmanthus	Y	Y		Y	Y	Y		FS PS	5.5-7.4	8 	10-12(20) x 10-12 dense, rounded, full to ground, impenetrable	Zones 6-9; extremely spiny leaves; moist, acid, well-drained soils best, but is adaptable; urban-tolerant, shade-tolerant; variegated cultivars tend to be less cold-hardy than the species; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Osmanthus xfortunei</i>	Fortune’s Tea Olive, Fortune’s Osmanthus	Y	Y		Y	Y	Y		FS PS	5.5-7.4	8 	12-18(20+) x 10-15, dense, rounded, full, green haystack	Zones 6-9; can be pruned to any height; spiny leaves; moist, acid, well-drained soils best, but is adaptable; urban-tolerant, shade-tolerant; very fragrant flowers October into late fall; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Osmanthus ilicifolius</i> (see <i>O. heterophyllus</i>)	Holly Osmanthus												
<i>Photinia xfraseri</i>	Fraser Photinia (“Red Tip”)	Y	Y			Y	Y		FS PS	5.5-7.4	7 	10-15+ x 6-10, upright, oval, dense	Zones 6-9; prefers well-drained soil, pH-adaptable, will not tolerate wet soils; good tolerance to shade, and urban conditions; distinctive red new growth; good screen and hedge; cold damage, insect, and disease issues, especially in moist, humid weather – look for resistant varieties; flowers are foul-smelling; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Picea abies</i> ‘Clanbrassilliana’, ‘Maxwellii’, ‘Nidiformis’ (‘Bird’s Nest Spruce’), ‘Procumbens’, ‘Pumila’, others	Dwarf Norway Spruce	Y*							FS	5.5-6.4	7 	2-6 x 3-8, dwarf, stiff, compact mound	Zones 3-8; prefers moist, acid, sandy, well-drained soils; can tolerate denser soils if well-drained; shallow, spreading root system, so mulch; does better in cooler North; best to use as a specimen, and only in a customized environment

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Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Picea abies</i> forma ‘pendula’, others	Dwarf Norway Spruce (weeping cultivars)	Y*							FS	5.5-6.4	7 	2-20 x 3-8, weeping; if not staked, then prostrate and trailing	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Picea glauca</i> ‘Conica’	Dwarf Alberta Spruce, Dwarf White Spruce	Y*							FS	5.5-6.4	4	3-6(10-12) x 2-4 broad, dense, pyramidal, narrower with age	Same as <i>P. abies</i> , although very slow-growing and usually shorter but location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Picea pungens</i> ‘Fat Albert’, ‘Glauca Globosa’, ‘Glauca Pendula’(‘Glauca Procumbens’, ‘Glauca Prostrata’) ‘Hoopsii’, ‘Iseli Foxtail’ (‘Foxtail’, ‘Iseli Fastigiate’), ‘Montgomery’, others	Dwarf Colorado Spruce (low-growing cultivars)	Y*	Y*						FS	5.5-7.5	4	3-12 x 3-10, dense, flat, rounded-to-conical, depending on cultivar	Zones 4-7; prefers moist, well-drained, deep, rich soils, but very adaptable; more drought-tolerant than other spruces; does better in North, like other spruces; ‘Pendula’ is weeping-to-prostrate ground-cover; location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Pieris japonica</i>	Japanese Pieris (smaller cultivars)	Y*			Y	Y			PS SH	5.5-6.2	1	3-6(12) x 3-5, upright, stiff, spreading branches, rounded outline	Zones 4(5)-7; NEEDS Excellent growing conditions: moist, acid, well-drained soil, high in peat/organic material; very fussy in our area; needs at least part shade here; can get bigger – to 9-12 feet tall and like a haystack; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Pinus mugo</i> var. <i>mughus</i> (var. <i>mugo</i>) ‘Compacta’, <i>P. mugo</i> var. <i>pumilio</i> (‘Pumilio’), others	Dwarf Mugo Pine, Swiss Mountain Pine	Y							FS PS	5.5-7.5	4	2-10 x 2-10, usually low, dense, spreading	Zones 4-7; prefers deep, moist, well-drained, loamy soils, but adaptable, as long as well-drained; does better in North; suspect high night- time temperatures negatively impact growth; form extremely variable depending on cultivar and from plant to plant in same cultivar
<i>Pinus thunbergii</i> ‘Mini Mounds’, ‘Nana’, ‘Thunderhead’, others	Dwarf Japanese Black Pine	Y	Y						FS PS	6.2-7.4	7💧	3-9 x 3-12, dense, form variable depending on cultivar	Zones 6-8; best growth in moist, fertile, well-drained soil, but will grow in sand; salt-, heat-, and drought-tolerant; usually short-lived inland in the South (5-15 years); pyramidal-to-wide-spreading, irregularly rounded; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Platycladus orientalis</i> (formerly <i>Thuja orientalis</i>) ‘Bonita’, ‘Juniperoides’, ‘Minima’, others	Oriental Arborvitae (dwarf cultivars)	Y	Y						FS PS	5.5-7.4	8💧	3-4 x 3-4, dwarf, globe or conical, fine-textured	Zones 6-11; prefers well-drained soils, but is tolerant of most soils; less appealing to deer than <i>T. occidentalis</i>

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
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<i>Platycladus orientalis</i> ‘Aurea Nana’ (‘Berckman’s Golden Arborvitae’), ‘Beverly Hills’ ‘Elegantissima’, ‘Filiformis Aurea’, others	Oriental Arborvitae (yellow to golden, medium-tall cultivars)	Y	Y			Y	Y		FS PS	5.5-7.4	8💧	6-12 (18) x 4-12, depending on cultivar, fine-textured, pyramidal-to-upright oval	Same as above but with yellow to golden leaves; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Platycladus orientalis</i> ‘Baker’, ‘Blue Cone’, ‘Fruitlandii’, ‘Green Cone’, others	Oriental Arborvitae (blue-green to green, medium-tall cultivars)	Y	Y			Y	Y		FS PS	5.5-7.4	8💧	6-12 (18) x 4-12, depending on cultivar, fine-textured, pyramidal-to-upright oval	Same as above but with blue-green to green leaves; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Prunus laurocerasus</i>	English Laurel	Y			Y	Y	Y*		PS SH	5.5-7.4	7💧	6-15+ x 4-12(25+), depending on cultivar; upright, dense, wide-spreading	Zones 6-8; needs moist, WELL-DRAINED, highly-organic soils; adaptable to pH; salt-spray-tolerant; wet, poorly-drained soils and overhead irrigation hard on these plants leading to root rot and fungal leaf diseases; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Prunus laurocerasus</i> ‘Forest Green’, ‘Otto Luyken’, ‘Schipkaensis’, ‘Zabeliana’, others	Dwarf English Laurel	Y			Y	Y			FS PS SH	5.5–7.4	7 	3-6(10) x 4-12(25), upright, spreading, dense	Same as above; ‘Zabeliana’ is very wide-spreading
<i>Pyracantha coccinea</i> ‘Apache’, ‘Dart’s Red’ (‘Interrada’), Gnome® (‘Gnozam’), ‘Navaho’ (<i>P. angustifolia</i> x <i>P.</i> ‘Wateri’), ‘Pueblo’, ‘Rutgers’, others	Scarlet Firethorn, Pyracantha (medium to large cultivars)	Y			Y				FS PS	5.5–7.4	7 	6-8+ x 4-12, depends on cultivar used and pruning, stiff, thorny branches	Zones 6-9; needs well-drained soil; tolerates dry conditions; usually need prune regularly for best appearance; can make part of an impenetrable hedge or screen; attractive and mildly poisonous berries; dangerous thorns; issues with fireblight, other blights, aphids, lace bugs, scale, so use resistant cultivars; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Pyracantha coccinea</i> ‘Cherri Berri’ (<i>P. crenatoserrata</i>), ‘Fiery Cascade’, ‘Mohave’ (<i>P. koidzumii</i> x <i>P. coccinia</i> ‘Wyattii’), Saphyr™ series, ‘Teton’ (‘Orange Glow’ x <i>P. crenulata</i> var. <i>rogersiana</i> ‘Flava’)	Scarlet Firethorn, Pyracantha (large cultivars)	Y				Y			FS	5.5–7.5	7 	8-15 x 6-12, rangy, both upright and weeping	Same as above

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<i>Pyracantha koidzumii</i> ‘Low-Dense’ (‘Lowdense’), ‘Red Elf’, ‘Ruby Mound’, others	Formosa Firethorn	Y	Y		Y				FS PS	5.5-7.4	7💧	4-6 x 6+, dense, mounding	Zones 6-9; needs well-drained soil; good in hot, dry conditions; fireblight, scab, lace bugs, scale are all problems
<i>Pyracantha koidzumii</i> ‘Rosedale’, ‘Santa Anna’, ‘Victory’, ‘Watereri’, others	Formosa Firethorn, Pyracantha	Y			Y				FS PS	5.5-7.4	7💧	6-12 x 6-12, large, multi-stemmed, stiff, upright and unruly	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Raphiolepis indica</i> (many cultivars, many are <i>R. xdelacourii</i>)	Yeddo Hawthorne, Indian Hawthorn (low-growing cultivars)	Y	Y	Y	Y	Y			FS PS SH	6.2-7.4	7💧	2.5-5 x 3-5, depends on cultivar, dense, rounded to mounding	Zones 7b-10; prefers moist, well-drained soils; will grow in moist sand; drought- and salt-tolerant; good planter and container plant; leaf spot a problem in wet locations; “deer candy”

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<i>Rhaphiolepis indica</i> ‘Bonfire’, ‘Eskimo’, Majestic Beauty™ (‘Montic’), ‘Pink Lady’, Rosalinda® (‘Conda’), ‘Rosea’, Spring Sonata™, Springtime® (‘Monme’), White Enchantress® (‘Monant’), many others	Yeddo Hawthorne, Indian Hawthorn (species and taller cultivars)	Y	Y		Y	Y			FS PS SH	6.2- 7.4	7 	4-8 x 4-10, depending on cultivar, larger, dense, rounded to mounding	Same as above
<i>Rhododendron</i> ‘Gable’ Hybrids	Gable Hybrid Azalea (many cultivars)	Y*			Y	Y			PS SH	5.4- 6.2	4	2-4+ x 2-4+, varies by cultivar	Zones 6-9; prefers moist, well-drained soil rich in organic content; mulch shallow roots; high shade usually best; lace bug, voles, deer are all problems; blooms late April to May, (some) early June
<i>Rhododendron</i> ‘P.J.M.’	PJM Rhododendron (many cultivars)	Y*			Y	Y			PS SH	5.4- 6.2	4	3-6 x 3-6, rounded	Zones 4-9; blooms late March to April; otherwise same as above
<i>Rhododendron</i> x (many, many hybrid groups and cultivars)	Hybrid Evergreen Azaleas	Y*			Y	Y			PS SH	5.4- 6.2	4	1-10 x 2-8, depends on cultivar, all are fairly dense and twiggy	Zones 4-9; bloom times range from March to June, and then again in the Fall for some varieties; otherwise same as above

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
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<i>Rosa banksiae</i> ‘Lutea’, others	Lady Banks’ Rose	Y			Y				FS PS	6.2-7.4	7💧	15-20 (climbing) x 10-15 and 2-4 thick, sprawling	Zones 7-8; prefers well-drained soil rich in organic content; tolerant of pH range, some salt- and urban-tolerance; easy to grow, requires some restraint once established; fairly pest free; “thorn-less,” evergreen rose; ‘Lutea’ has yellow blooms
<i>Rosmarinus officinalis</i> ‘Huntington Carpet’, ‘Prostratus’, others	Rosemary (groundcover cultivars)	Y	Y	Y	Y				FS	5.5-7.4	7💧	1-2 x 3-8, prostrate, mounding, dense, flowering ground-cover	Zones 6-8; prefers well-drained soil (not wet); salt-tolerant; deer-resistant; very aromatic
<i>Rosmarinus officinalis</i> ‘Arp’, ‘Blue Spire’, ‘Majorca Pink’, ‘Roman Beauty’, ‘Tuscan Blue’, others	Rosemary (upright cultivars)	Y	Y		Y				FS	5.5-7.4	7💧	3-5 x 3-4, fine-textured, upright, round	Same as above; can prune into fairly tight, low hedge
<i>Santolina chamaecyparissus</i>	Santolina, Lavender Cotton	Y	Y	Y					FS	5.5-7.4	7💧	1-2 x 2-4, low, mounding, fine-textured, ground-cover	Zones 6-9; prefers, dry, well-drained, low-fertility soils; adaptable; will grow in sand; avoid excessive fertility; drought- and salt-tolerant

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
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<i>Sarcococca confusa</i>	Sarcococca	Y			Y				PS SH	5.5-6.2	7💧	3-4 x 3-4, dense, rounded	Zones 7-8; prefers loose, acid, moist, well-drained soils rich in organic content; will sucker and form colonies; good atmospheric pollution- and drought-tolerance once established; fragrant; deer-resistant; not as cold-hardy as other <i>Sarcococca</i>
<i>Sarcococca hookeriana</i>	Himalayan Sweetbox, Sarcococca	Y			Y	Y			PS SH	5.5-6.2	7💧	4-6 x 4-6, dense, mounding	Zones 6-8; most cold-hardy <i>Sarcococca</i> ; otherwise same as <i>S. confusa</i>
<i>Sarcococca hookeriana</i> var. <i>humilis</i>	Low-growing Himalayan Sweetbox, Sarcococca	Y			Y	Y			PS SH	5.5-6.2	7💧	1-2 x 2-4, low, mounding, dense	Same as above, but less cold-hardy than <i>S. hookeriana</i> species; groundcover or low shrub
<i>Sarcococca orientalis</i>	Sarcococca	Y			Y	Y			PS SH	5.5-6.2	7💧	2-4 x 2-4, low, mounding, dense	Same as <i>S. hookeriana</i>
<i>Sarcococca ruscifolia</i>	Fragrant Sarcococca	Y			Y	Y			PS SH	5.5-6.2	7💧	2-3+ x 2-3+, dense, mounding	Zones 7-9; otherwise same as <i>S. hookeriana</i> , but not as cold-hardy; very fragrant flowers
<i>Serissa foetida</i> (formerly <i>S. japonica</i>)	Yellow-Rim	Y			Y	Y			PS SH	5.5-7.4	7💧	3-4 x 3-4, fine-textured, rounded	Zones 7-9; prefers moist, well-drained soils, but is very adaptable; no standing water or permanently wet soils; has great drought-tolerance; competes very well under shade trees; variegated leaf edge indicates name

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<i>Skimmia japonica</i>	Japanese Skimmia	Y			Y	Y			PS SH	5.5-6.2	4	3-4+ x 3-4+ dense, rounded-to-haystack-like outline	Zones 7-9; prefers well-drained soil rich in organic content; will grow in chalky (limestone) soil; mites damage foliage; best performance in Pacific Northwest where it is usually larger; high heat and humidity seem to this drain plant in the South
<i>Skimmia reevesiana</i>	Reeves Skimmia	Y			Y	Y			PS SH	5.5-6.2	4	1.5-3 x 2-3, low-growing, ground-cover-like	Zones (6)7-9; prefers rich, moist, acid soil; appears to be more adaptable than <i>S. japonica</i>
<i>Taxus cuspidata</i>	Japanese Yew (low-growing cultivars)	Y				Y			FS PS SH	4.5-7.0	4	1-5 x 3-8, low, dense rounded mass	Zones 4-7; needs good drainage, does not like ‘wet feet’; poisonous leaves; good urban-tolerance; slow growth rate; often used for foundations, topiary, screens, massing; most adaptable for the yew for the southeast
<i>Taxus cuspidata</i>	Japanese Yew (species and large cultivars)	Y				Y			FS PS SH	4.5-7.0	4	8-20 x 8-20, upright to tall spreading, depending on cultivar	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Ternstroemia gymnanthera</i>	Cleyera, Japanese Ternstroemia (species and cultivars)	Y	Y		Y	Y			PS SH	5.5-7.4	4	8-10 x 5-6, upright, oval, full, dense shrub	Zones 7-10; prefers moist, well-drained soils; not tolerant of wet, poorly-drained soils; part shade on north or east side of structures is best; prunes well; ‘Phyllis Ann’ cultivar is resistant to shot-hole fungus; also listed as <i>Cleyera japonica</i> ; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Teucrium chamaedrys</i>	Wall Germander	Y	Y	Y					FS PS	5.5-7.4	4	1-1.25 x 2-3, low-growing, mounding shrub	Zones 5-9; needs well-drained soils; not suited to excessive moisture; used for edging, low hedges, and rock gardens
<i>Thuja orientalis</i> (see <i>Platyclusus orientalis</i>)	Oriental Arborvitae												
<i>Viburnum xburkwoodii</i> (<i>V. carlesii</i> x <i>V. utile</i>) 'Chaneultii', 'Park Farm Hybrid', others	Burkwood Viburnum (hybrid and cultivars)	Y	Y		Y	Y			FS PS SH	5.5-7.4	7💧	6-10 x 4-7 (12-16), depending on cultivar, upright, multi-stemmed	Zones 5-8; prefers slightly moist, well-drained soil; tolerant of soil type, pH, pollution, heat, cold, and drought; very fast growing on good sites; flowers intensely fragrant; use with other plants in screens and borders because the somewhat open mass of stems can look unkempt; semi-evergreen in colder climates; susceptible to nematodes if drainage is poor; location of use is predicated on the mature or maintained height of the plant or cultivar

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



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Table 2B: Allowed Shrubs, Evergreen, Not Native to NC Piedmont		Requirements							Recommended Cultural Information					
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes	
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵			
						Constructed	Solid Hedge	Riparian						
<i>Viburnum xburkwoodii</i> 'Conoy'	Conoy Viburnum	Y	Y		Y	Y			FS PS SH	5.5-7.4	7 	4-8 x 6-9	Zones 5b-8; similar to above, but shorter and more cold-tolerant (evergreen north to Zone 6a); smaller, glossy, dark green leaves than <i>V. xburkwoodii</i> ; drought-tolerant; pest- and disease-free; flowers non-fragrant	
<i>Viburnum davidii</i>	David Viburnum (species and cultivars)					Y		Y	FS PS	5.5-6.8	5	3-5 x 3-5, compact, rounded, dense	Zones 7b-9; prefers moist, well-drained soil; can be particular about siting; usually for collectors rather than widespread use; flowers not notably fragrant	
<i>Viburnum obovatum</i> 'Mrs. Schiller's Delight', 'Reifler's Dwarf', others	Walter Viburnum (dwarf cultivars)	Y	Y		Y				FS PS	6.2-7.4	7 	2-5(6) x 2-5(8), small leaves, habit depends on cultivar	Zones 6-9; evergreen to 15°F; prefers moist, well-drained soil; tolerant of soil type and pH; grows in wet conditions in the wild, but has shown dry tolerance in cultivation; flowers not notably fragrant, but cultivars have showier flowers than the species; a dwarf, flowering, lustrous, dark green leaved alternative to some <i>Ilex</i> species; ‘St. Paul’ has pendulous branches	
<i>Viburnum obovatum</i> 'Christmas Snow', 'St Paul'	Walter Viburnum, Small Viburnum (small to medium cultivars)	Y			Y	Y			FS PS SH	5.5-6.8	7 	6-12 x 6-12, wild, open, irregular	Same as above; location of use is predicated on the mature or maintained height of the plant or cultivar	

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						Constructed	Solid Hedge	Riparian					
<i>Viburnum</i> ‘Pragense’ (formerly <i>V. xpragense</i>) (<i>V. rhytidophyllum</i> x <i>V. utile</i>)	Prague Viburnum	Y	Y		Y	Y			PS SH	6.2-7.4	7💧	10-12 x 5-7, irregularly oval to rounded, upright	Zones 7-9; prefers deep, rich, moist, well-drained soil; tolerant of soil type and high pH; good specimen or screening plant; denser with pruning and more sun; flowers slightly fragrant; deer resistant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum rhytidophyllum</i>	Leatherleaf Viburnum	Y				Y			FS PS SH	4.5-6.6	4	10-15 x 10-15, upright, loose and irregular, coarse	Zones 5-8; prefers deep, rich, moist, well-drained soil and shade; tolerant of sun, deep shade, pH and soil types; leaves are evergreen to 10°F, but stems to -15°F and will grow back if stems not killed; protect from winter sun and wind; large, dark green, textured leaves; flowers slightly fragrant; good as a background plant; deer resistant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum tinus</i> ‘Compactum’, ‘Spring Bouquet’	Laurustinus (smaller cultivars)	Y	Y		Y	Y			FS PS SH	6.2-7.4	7💧	4-5(12) x 4-5(12), dense, full, rounded shrub	Zones 7b-9; prefers deep, rich, moist, well-drained soil; tolerant of soil type and pH; good specimen plant, or as foundation plant or low hedge if given winter protection; these cultivars have done well in Zone 7; flowers not notably fragrant; deer resistant; location of use is predicated on the mature or maintained height of the plant or cultivar

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Viburnum tinus</i>	Laurustinus (species and taller cultivars)	Y	Y		Y	Y			FS PS SH	6.2-7.4	7💧	6-12 x 6-12, depending on cultivar	Culture same as above; good specimen or screening plant; species is a tough, rapid-growing, dense, bushy, large shrub that grows to 10 feet in 5 years and ultimately much larger; marginal in Zone 7; flowers not notably fragrant; deer resistant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Yucca filamentosa</i>	Adam’s Needle Yucca	Y	Y		Y	Y			FS PS	5.4-7.4	8💧	1-2.5 x 1.5-4, flower stalks to 6 feet tall	Zones 5-9; sword-like leaves can be dangerous; this variety more Southern and coastal

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Table 2C: Allowed Shrubs, Deciduous, Native to NC Piedmont

Table 2C: Allowed Shrubs, Deciduous, Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Aesculus sylvatica</i>	Painted Buckeye	Y*			Y	Y		Y	PS SH	5.5-6.8	4	6-15 x 6-10, single or multi-stemmed	Zones 4-8; prefers moist, well-drained soil rich in organic content; prefers acid pH, but adaptable; specimen woodland large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Aesculus parviflora</i>	Bottlebrush Buckeye	Y*			Y	Y			PS SH	5.5-6.8	4	8-12 x 8-15 upright, wide-spreading, multi-stemmed	Zones 4-8; prefers moist, well-drained soil rich in organic content; prefers acid pH, but adaptable; specimen plant, clumping or massing; suckering to form a colony; woodland understory shrub or small tree; white flowers June to July; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Alnus serrulata</i>	Tag, Hazel, or Smooth Alder	Y*				Y		Y	FS PS	5.5-7.4	9 	6-10(20) x 10-20, multi-stemmed,	Zones 5-8; prefers moist soils with good drainage best; found along stream, pond, and lake edges; suckering, colonizing shrub or mass of small trees and can spread to exclude other species; is tolerant of dry and poor soil conditions; location of use is predicated on the mature or maintained height of the plant or cultivar

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Amelanchier canadensis</i>	Shadblow Serviceberry, Thicket Serviceberry	Y			Y	Y		Y	FS PS	5.5-7.4	9 	6-15 x 6-15, dense, upright, multi-stemmed	Zones 3-8; prefers moist to wet soils with good organic content; grows in bogs, swamps and along the coast in the wild; pollution-tolerant; suckering to form a mass; juicy, blueberry-like fruit (attracts birds); location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Aronia arbutifolia</i> 'Brilliant' ('Brilliantissima')	Red Chokeberry	Y				Y		Y	FS PS	5.5-7.4	8 	6-10 x 3-5+ (variable), upright, open, rounded top, open underneath	Zones 4-9; prefers good drainage, but adaptable to many soil types, even poor soils, from wet to dry; tends to sucker, forming colonies; good for massing; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Aronia melanocarpa</i>	Black chokeberry	Y*				Y		Y	FS PS	5.5-7.4	8 	3-5(10) x 3-5+ (variable), upright	Zones 3-9; prefers good drainage, but will grow in low, wet areas or in dry sand; forms suckering colonies; hybridizes freely with <i>A. arbutifolia</i>
<i>Callicarpa americana</i>	American Beautyberry	Y*				Y		Y	FS PS	5.5-7.4	7 	3-8 x 3-5, loose, open	Zones 3-9; prefers good drainage, reliable moisture; denser and better fruit in full sun; has large leaves and a coarse texture

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




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<i>Calycanthus floridus</i>	Common Sweetshrub, Carolina Allspice, Strawberry Shrub	Y	Y		Y	Y			FS PS	5.5-7.4	7 	6-10 x 6-12, dense, bushy, rounded	Zones 4-9; easy to grow in deep, moist loam; adaptable; performs best in sun; becomes straggly in shade; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Castanea pumilla</i>	Allegheny Chinkapin				Y	Y			FS PS	5.5-6.8	7 	6-10 x 4-8	Zones 5-9; grows in dry woodlands; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Ceanothus americanus</i>	New Jersey Tea, Redroot, Wild Snowball	Y			Y	Y			FS PS	5.5-6.8	7 	3-4 x 3-5 low, broad, compact, with upright branches	Zones 4-8; found in sandy woods, dry prairies, mixed deciduous forests; very adaptable
<i>Cephalanthus occidentalis</i>	Buttonbush				Y	Y		Y	FS PS	5.5-6.8	9 	3-6 (10-15) x 3-6, gangly, upright	Zones 3-11; prefers moist to wet soils, near or in water but withstands low-water conditions associated with droughts; forms thickets; location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Chionanthus virginicus</i>	Fringe Tree	Y	Y		Y	Y		Y	FS PS	5.5-6.8	7 	12-20 x 12-20, spreading, open	Zones 4-9; prefers moist, deep, fertile, acid soils, but is very adaptable; more compact in full sun; found along stream banks and swamp edges, and as understory in woodlands; drought- and shade-tolerant; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Clethra alnifolia</i>	Clethra, Pepperbush, Summersweet	Y	Y		Y	Y		Y	FS PS	5.5-6.8	8 	4-8(12) x 4-6(10) oval, round top, dense	Zones 4-9; prefers moist, well-drained soil rich in organic content; grows in wet places in the wild; salt-tolerant; easy to grow; forms suckering colonies; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Cornus amomum</i>	Silky Dogwood	Y*			Y	Y		Y	FS PS	5.5-7.4	9 	6-10 x 6-10, rounded, twiggy, multi-stemmed, suckering	Zones 4-8; moist, part-shade environment, but very adaptable; native to low woods and along streams; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Cornus racemosa</i>	Gray Dogwood	Y*			Y	Y		Y	FS PS	5.5-7.4	9 	10-15 x 10-15, multi-stemmed, erect	Zones 3-8; prefers moist, well-drained soil is best, but very adaptable; will grow in wet or dry soils, shade to sun; often found along streams; suckering; difficult to find in cultivation; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Corylus americana</i>	American Filbert	Y*			Y	Y			FS PS	5.5-7.4	4	8-10(to 15) x 8-10, multi-stemmed, rounded top, leggy below	Zones 4-9; prefers moist, well-drained, loamy soil; pH-adaptable; usually found as an understory of moist woodlands; Japanese beetles, caterpillars, scale, blight, other diseases are a problem; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Dasiphora fruticosa</i> subsp. <i>floribunda</i> (formerly <i>Potentilla fruticosa</i>)	Shrubby Cinquefoil	Y	Y	Y	Y				FS PS	5.5-6.9	5	1-4 x 2-4+, fine-textured, bushy	Zones 4-6(7); best in fertile, moist, well-drained soils, but is tolerant of poor, dry soils, and is very tolerant of high pH; does not perform very well in the south (high night-time temperatures)
<i>Dirca palustris</i>	Leatherwood	Y*			Y	Y		Y	PS SH	5.5-6.8	9💧	3-6 x 3-6, irregular, somewhat dense, spreading	Zones 4-9; prefers deep, organic soils; does best in moist to wet, shady areas; grows along streams in the wild
<i>Euonymus americanus</i>	Strawberry Bush, ‘Hearts-a-Burstin’	Y*			Y	Y			PS SH	5.5-7.4	4	4-6 x 3-4, open, loose arching	Zones 6-9; prefers well-drained soils; very pH- and soil-adaptable; suckering; red seeds are showy in autumn; understory shade plant
<i>Fothergilla gardenia</i>	Dwarf Fothergilla (species and cultivars)	Y*			Y	Y		Y*	FS PS	4.5-6.2	4	2-4 x 3-5, rounded, dense, spreading, slender stems	Zones 5-9; native to Coastal Plain pine savannas and pocosins; best in acid soils, moisture, and excellent drainage; suckering; best flowers and fall color in full sun; an NC-DENR stormwater BMP plant

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

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<i>Fothergilla major</i>	Large Fothergilla	Y*			Y	Y			PS SH	5.5-6.2	4	6-10 x 6-10, variably-rounded, multi-stem; dense with erect stems	Zones 4-8; prefers rich, moist, well-drained, acid soil; needs cool moisture and some shade in the Piedmont; suckering
<i>Hamamelis virginiana</i>	Common Witchhazel (smaller cultivars)	Y			Y	Y		Y	FS PS SH	5.5-7.5	4	5-8(10-15) x 5-8(10-15), several large, crooked branches	Zones 3-8; prefers moist, well-drained soil; avoid extremely dry conditions; full sun to shade; a picturesque small tree or large shrub;
<i>Hydrangea arborescens</i> ‘Annabelle’, others	Smooth Hydrangea	Y*			Y	Y			FS PS SH	5.5-7.5	4	3-5 x 3-5+, low-growing, clumpy, rounded, coarse	Zones 4-9; best performance in rich, moist, well-drained soil; pH-adaptable; best in partial shade, but will take full sun, if moisture provided; can be big, unruly, and form suckering colonies; needs room
<i>Ilex decidua</i>	Possomhaw (species and cultivars)	Y*				Y		Y	FS PS	5.5-7.4	9 	15-20 x 18-25+, rounded, with many ascending stems and branches	Zones 5-9; larger than <i>I. verticillata</i> ; also better-adapted to alkaline soils; <i>Ilex opaca</i> can serve as a male pollinator; large shrub or small tree; will sucker into masses; location of use is predicated on the mature or maintained height of the plant or cultivar

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


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<i>Ilex verticillata</i>	Common Winterberry, Black Alder (species and cultivars)	Y				Y		Y	FS PS	4.5-6.5	9 	4-6(15) x 4-6(15), depending on cultivar, oval-rounded, dense, twiggy	Zones 3-9; prefers moist, well-drained soil rich in organic content; does well in light or heavy soils; native to swampy areas; chlorotic in high pH soils; best berry formation in full sun (and with both male and female plants); forms a dense colony of suckering stems; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Lindera benzoin</i>	Spice Bush	Y*			Y	Y		Y	FS PS SH	5.5-6.8	5	6-12 x 6-12, rounded outline, looser in shade	Zones 4-9; moist, acid, well-drained soils; adaptable to drier soils, but best performance in moist conditions and half-shade; full and dense in full sun; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Magnolia virginiana</i> ‘Havener’, ‘Henry Hicks’, ‘Mattie Mae Smith’ (‘Mardigras’), Sweet Thing™ (‘Perry Page’, var. <i>australis</i>), ‘Willowleaf Bay’, others	Sweetbay Magnolia (smaller cultivars)	Y*				Y		Y	PS SH	5.5-6.8	9 	12-30 x 8-15, upright, multi-stemmed	Zones 5-9; prefers moist, acidic, soils; grows in moist to wet areas in swamps and along streams; evergreen in mild winters, primarily semi-evergreen to deciduous, large shrub or small tree; species grows to 60 feet tall; location of use is predicated on the mature or maintained height of the plant or cultivar

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


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Table 2C: Allowed Shrubs, Deciduous, Native to NC Piedmont		Requirements							Recommended Cultural Information				
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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Physocarpus opulifolius</i>	Common Eastern Ninebark (species and cultivars)	Y*			Y	Y		Y	FS PS	5.5-7.4	8 	5-10 x 6-10, upright, spreading with stiffly-recurved branches	Zones 4-7; very adaptable to wet or dry, sun or shade, acidic or basic soils; grows in rocky banks along streams; cultivars have red or yellow new and fall foliage; ragged in winter; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Potentilla fruticosa</i> (see <i>Dasiphora fruticosa</i> subsp. <i>floribunda</i>)	Shrubby Cinquefoil												
<i>Rhamnus caroliniana</i>	Carolina Buckthorn, Indian Cherry	Y	Y		Y	Y	Y		FS PS	6.2-7.4+	8 	10-15 x 6-10, upright, oval-rounded	Zones 5-9; prefers limestone, high pH soils, but is very adaptable; withstands urban environments, difficult conditions, and waste areas; birds spread seeds; large shrub or small tree; related, naturalized, foreign species <i>R. cathartica</i> and <i>R. frangula</i> ('Tallhedge') are invasive in the East; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron arborescens</i>	Sweet Azalea	Y*			Y	Y		Y	PS SH	4.5-6.2	4	8-15 x 8-15, erect, open, fine-textured	Zones 4-7; prefers light, well-drained, acid, constantly-moist soils; high shade best; native to banks of mountain streams; location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Rhododendron atlanticum</i>	Coast Azalea	Y*			Y	Y		Y	PS SH	4.5-6.8	4	3-6 x 3-6, rounded, refined	Zones 5-9; light, well-drained (sandy), acid, moist soils, high shade; native to open pine woods, especially along streams, in the Coastal Plain; suckering
<i>Rhododendron austrinum</i>	Florida Azalea	Y*			Y	Y		Y	PS SH	5.5-6.8	4	8-10 x 5-8, loose, open rounded, multi-stem	Zones 7-9; prefers moist, well-drained soil and high shade; somewhat pH- and soil-condition-tolerant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron calendulaceum</i>	Flame Azalea	Y*			Y	Y		Y	PS SH	5.4-6.2	4	4-8+ x 4-8+, loose, open, upright	Zones 5-7; prefers light, well-drained, constantly-moist, acid soils; native to southern Appalachian mountains; does not tolerate heat as well as other Azaleas; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron canescens</i>	Sweet – Piedmont Azalea (aka Florida Pinxter Azalea)	Y*			Y				PS SH	5.4-6.5	4	10-15 x 6-8, tall, loose, open	Zones 5-9; prefers well-drained, moist acid soils; tolerates shade better than other deciduous azaleas; native along slopes and stream banks in high shade; stoloniferous, suckering to form colonies; location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Rhododendron periclymenoides</i>	Pinxterbloom Azalea	Y*			Y	Y			PS SH	4.5-6.2	4	(2)4-8(10) x 4-8, low, much-branched, stoloniferous	Zones 4-8; prefers well-drained, acid soils, with regular moisture; has adapted to dry, sandy, and rocky soils of the Appalachian Mountains; spreads by stolons
<i>Rhododendron prinophyllum</i>	Roseshell Azalea	Y*			Y	Y			PS SH	5.4-7.4	4	4-8 x 4-8, relatively dense with spreading, horizontal nature	Zones 4-8; prefers well-drained, moist soils; more tolerant of high-pH soils than other azaleas
<i>Rhododendron vaseyi</i>	Pinkshell Azalea	Y*			Y	Y		Y	PS SH	4.5-6.2	4	5-10 x 4-8, upright, loose, irregular	Zones 4-7; prefers well-drained, rocky, constantly-moist, acid soils; native to the Blue Ridge Mountains; not as heat-tolerant as other azaleas; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron viscosum</i>	Swamp Azalea	Y*			Y	Y		Y	PS SH	4.5-6.2	5	1-8 x 3-8, loose, open, spreading	Zones 4-9; prefers acid, moist soils; native to swamps; tolerates wetter conditions, but still does best with good drainage

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<i>Rhus aromatica</i> ‘Gro-low’ (‘Gro-Low’)	Gro-Low Fragrant Sumac	Y*	Y*	Y*	Y*	Y*			FS PS	5.5-7.4	7	2-3 x 6-8, low, dense, wide-spreading	Zones 3-9; prefers well-drained, acid soils, but pH-tolerant; drought-tolerant; has not performed well in wet, heavy soils; good for bank stabilization, rooting where stems touch ground, and forming colonies; should only be planted where this tendency can be contained or is desirable; should not be used as specimen, foundation, or container planting	
<i>Rhus aromatica</i> ‘Green Globe’, ‘Konza’	Fragrant Sumac (medium-height cultivars)	Y*	Y*		Y*	Y*			FS PS	5.5-7.4	7	4-8 x 4-8, dense, rounded with flat top	Same as above	
<i>Rhus copallina</i> (<i>Rhus copallinum</i>)	Flameleaf or Shining Sumac	Y*	Y*			Y*		Y*	FS PS	5.5-7.4	7	15-25 x 15-25+, compact and dense when young, spreading and more open with age	Zones 4-9; prefers well-drained soils; drought-resistant and pH-tolerant; use only in dry, rocky areas, on banks, waste places; aggressively spreading and suckering when established, forming large colonies; should only be planted where this tendency can be contained or is desirable; should not be used as specimen, foundation, or container planting; location of use is predicated on the mature or maintained height of the plant or cultivar	

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						Constructed	Solid Hedge	Riparian					
<i>Rhus glabra</i>	Smooth Sumac	Y*	Y*			Y*			FS PS	5.5-7.4	7💧	10-15+ x 10-15+, multi-stemmed, erect	Same as above; can grow very large
<i>Rosa carolina</i>	Pasture Rose, Carolina Rose				Y	Y	Y	Y	FS PS	5.5-6.8	8💧	3-6 x 6-12+, erect, arching branches	Zones 4-9; prefers slightly acid soils amended with organic matter; native to low and wet ground beside swamps and streams; suckering to form dense thickets
<i>Rosa virginiana</i>	Virginia Rose				Y	Y	Y	Y	FS PS	5.5-6.8	7💧	4-6 x 6-8+, erect, arching branches	Zones 4-9; Prefers well-drained, slightly acid soils amended with organic matter; will grow in sand; suckering to form dense thickets
<i>Sambucus canadensis</i>	Common Elderberry				Y	Y		Y	FS PS	5.5-7.4	8💧	5-20 x 5-15, spreading, erect, multi-stemmed, with flat to rounded top	Zones 4-9; does best in moist conditions, but tolerates dry soil, and is pH-adaptable; suckers profusely, making large colonies once established; use in wet areas, along roadsides, to naturalize; attracts birds; location of use is predicated on the mature or maintained height of the plant or cultivar

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

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<i>Stewartia malacodendron</i>	Silky Stewartia				Y	Y		Y	PS SH	4.5-6.5	4	10-15+ x 10-15, spreading branches	Zones 5-8; prefers moist, well-drained soil rich in organic content; best with afternoon shade; native understory in broadleaf woods, ravines, and steep slopes near streams; root rot is a problem, so plant high and mulch; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar	
<i>Stewartia ovata</i>	Mountain Stewartia				Y	Y		Y	PS SH	4.5-6.5	7 	10-15 x 10-15, bushy, spreading branches	Same as above, except fewer problems with root rot.	
<i>Styrax americanus</i>	American Snowbell	Y*			Y	Y		Y	FS PS SH	4.5-6.5	4	6-10 x 4-8, wispy, high-rounded	Zones 5-9; prefers moist, loose, well-drained, cool, acid soil, mulch; native to lowlands bordering streams	
<i>Styrax grandifolius</i>	Bigleaf Snowbell	Y*			Y	Y		Y	PS SH	4.5-6.5	4	8-15 x 6-12, large, open	Zones 7-9; prefers loose, well-drained, acid soils; mulch needed; understory native in upland deciduous or mixed woods in well-drained or dry soils; shrub to small tree; location of use is predicated on the mature or maintained height of the plant or cultivar	

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<i>Vaccinium arboreum</i>	Farkleberry, Sparkleberry	Y			Y	Y			FS PS	4.5-5.5	7 	4-15(20) x 6-15, variable form	Zones 7-9; prefers acidic, well-drained soils; native to understory in dry, deciduous woodlands; fruit is inedible; noted heat- and drought-tolerance; ranges from a low shrub to a multi-stemmed tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Vaccinium ashei</i>	Rabbiteye Blueberry (species and cultivars)	Y				Y		Y	FS PS	4.5-5.5	4	8-10 x 8-10, habit like <i>V. corymbosum</i>	Zones 7-8; prefers moist, well-drained, ACIDIC soils with lots of organic matter; will grow in sand, if acidic, moist and mulched; mulch to keep the shallow, fibrous root system moist and protected; use raised beds in urban situations; good blueberry for Durham; fruits a little later than Southern Highbush varieties
<i>Vaccinium corymbosum</i>	Highbush Blueberry (Southern Highbush cultivars)	Y				Y		Y	FS PS	4.5-5.5	4	6-12 x 8-12, upright, dense, spreading	Zones 3-8; same cultural notes as <i>V. ashei</i> , above; Southern Highbush cultivars perform better in Durham than others; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Vaccinium elliotii</i>	Elliott Blueberry				Y	Y		Y	PS SH	4.5-5.5	8 	6-12 x 6-12, slender, upright, arching, multi-branched	Zones 6-9; found in acidic soils in well-drained and wet habitats as an understory along stream banks, wet thickets, and bottomland woodlands; noted tolerance of heat, drought, and wet conditions; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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<i>Vaccinium pallidum</i>	Hillside Blueberry				Y			Y	FS PS	4.5-5.5	7💧	1-2 x 1-2, low, spreading	Zones 4-8; found in dry, acid soils, under oaks, pine, in wet, maple low-lands, and in pine barrens and savannas; common on roadsides and in old fields; tolerant of soil conditions and drought; forms colonies
<i>Vaccinium stamineum</i>	Deerberry				Y	Y		Y	PS SH	4.5-5.5	8💧	3-15 x 3-12, variable, multi-stem, fine-textured	Zones 5-9; prefers well-drained, acid soils; size is dependent on soil quality and moisture; tolerant of drier, sandy soils (shorter in this habitat), and wetter, richer, heavier soils (taller here; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum acerifolium</i>	Mapleleaf Viburnum				Y	Y			PS SH	5.5-6.8	7💧	4-6+ x 4-6, upright, loose, open	Zones 4-8; prefers well-drained, slightly acid (but is pH-tolerant), slightly moist soils; tolerant of deep shade and drought; best for naturalizing; native to understory of dry, upland forests; suckers to form colonies; flowers not notably fragrant
<i>Viburnum bracteatum</i>	Bracted Viburnum	Y	Y		Y	Y		Y	FS PS SH	5.5-6.8	7💧	6-10+ x 6-8+, similar to <i>V. dentatum</i>	Zones 3-8; prefers well-drained, moist soils; good pH-, drought-, wet-, urban-, and salt-tolerance; leaves hold up better in heat than <i>V. dentatum</i> ; will sucker and form colonies; ‘Emerald Lustre’ is a rare, beautiful, cultivar that can grow to 15 feet tall and wide in Zones 6-8; flowers are malodorous; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Viburnum dentatum</i>	Arrowwood Viburnum (species and cultivars)	Y	Y		Y	Y			FS PS	5.5- 6.8	8💧	6-15 x 6-15, dense, spreading, with many finely- arching stems	Zones 3-8; prefers well-drained, moist soils; pH- tolerant; will grow in dry woodlands to stream and pond edges; good wet- and dry-tolerance; adaptable to heavy soils salt-tolerant; ultimate size depends on local habitat; will sucker and form colonies; flowers either somewhat malodorous or non-scented; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum lentago</i>	Nannyberry Viburnum, Sheepberry	Y			Y	Y			FS PS SH	5.5- 7.5	8💧	15-18 x 10-15, open, fine- textured, arching branches	Zones 3-7; easy to grow; pH-adaptable; tolerant of wet or dry and most soil conditions (well- drained is still best); large shrub or small tree; good for naturalizing; often suckers, producing large thickets; flowers not notably fragrant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum nudum</i>	Smooth Witherod, Possum-Haw Viburnum (species and cultivars)				Y	Y		Y	FS PS	5.5- 6.8	7💧	6-10(14) x 6-10(14), fairly dense, compact, rounded, with spreading, arching stems	Zones 3-9; prefers well-drained, slightly acid (although pH-tolerant), slightly moist soils; drought-and flood-tolerant; good for naturalizing and can be grown in floodplains in both sun and shade; an erect, large shrub, or more rarely, a small tree; flowers not notably fragrant; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Viburnum prunifolium</i>	Black Haw, Blackhaw Viburnum (species and cultivars)	Y			Y	Y			FS PS	5.5-6.8	8💧	12-15(30) x 8-12(20), stiff, upright branches, rounded top	Zones 3-9; prefers well-drained soil to thrive, but very adaptable to pH, wet or dry conditions, clay, pollution, sun or shade; pest- and disease-free; multi-stemmed small tree or shrub growing to 30 x 20 in 20 years (larger with more time); flowers attractive, but not notably fragrant; edible fruit (better after frost); location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum rufidulum</i> Emerald Charm™ ('Morton'), 'Royal Guard'	Rusty Blackhaw Viburnum, Southern Blackhaw	Y			Y	Y		Y	FS PS SH	5.5-6.8	8💧	15-20(40) x 10-15(30), irregular, open, spreading	Zones 4-9; prefers well-drained soil to thrive , but very adaptable to pH, wet or dry conditions, soil types, pollution, sun or shade; very drought-tolerant and very heavy clay-tolerant; more dense in full sun; a small tree or large shrub; cultivars listed are shorter than ultimate sizes shown for species; flowers have slight to no fragrance; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Xanthorhiza simplicissima</i>	Yellowroot				Y	Y		Y	FS PS SH	5.5-6.2	9💧	1-3 x 5+, flat-topped ground-cover, celery-like leaves	Zones 3-9; prefers moist to wet conditions, and acidic soils but will grow in dry conditions (won't spread as fast); common along streams in southern Appalachians; suckers freely forming a thicket

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Zenobia pulverulenta</i> 'Raspberry Ripple', 'Woodlanders Blue', 'Blue Skye', 'Misty Blue'	Dusty Zenobia				Y	Y		Y	FS PS	4.5- 6.2	5	2-6 x 3-5, upright, graceful, arching	Zones 5-9; semi-evergreen to deciduous; prefers moist, well-drained, acidic soils; requires even moisture levels; good native plant for wet areas

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Options 7, 8, and 9 are designated as a ♠ (Waterwise) species

Table 2D: Allowed Shrubs, Deciduous, Not Native to NC Piedmont

Table 2D: Allowed Shrubs, Deciduous, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Abeliophyllum distichum</i>	White Forsythia	Y	Y		Y	Y			FS PS	5.5-7.4	7 	3-5 x 3-4, dense, rounded; looks ragged with age	Zones 5-8; prefers well-drained soils; adaptable to pH, sun or light shade; cut down to ground periodically to rejuvenate
<i>Acer palmatum</i> var. <i>dissectum</i>	Cutleaf Japanese Maple (this variety and cultivars)	Y			Y				PS	5.5-8.6	4	6-8(to 12) x 6-8+, refined, rounded, mounding, spreading	Zones 5-8; depending on cultivar; needs moist, well-drained soil rich in organic content; protect from winter sun and wind; fairly heat- and drought-tolerant, once established (3-5 years); dappled shade best; needs sun for leaf colors; good as a specimen small tree or large shrub if allowed to be full to the ground; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Acer ginnala</i>	Amur Maple	Y	Y		Y	Y			FS PS	5.5-7.4	7 	15-20 x 15-25, rounded outline	Zones 3-8; best in moist, well-drained soils; tolerant of pH, soil types; multi-stemmed small tree or large shrub; location of use is predicated on the mature or maintained height of the plant or cultivar

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Table 2D: Allowed Shrubs, Deciduous, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Buddleia alternifolia</i>	Alternate Leaf Butterfly Bush	Y	Y						FS	5.5-7.4	7💧	10-20 x 10-20, lax, somewhat weeping, full	Zones 5-7; needs well-drained soils, preferring loose, loamy soil; blooms on previous years' wood, so prune right after flowering; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Buddleia davidii</i>	Butterfly Bush (species and cultivars)	Y	Y						FS	5.5-7.4	7💧	5-10 x 4-6, arching, spreading rounded	Zones 4-9; prefers moist, well-drained soil rich in organic content; but adaptable to pH and soil conditions; very tolerant of urban conditions; large, succulent, arching canes are tender in winter; cut to the ground to rejuvenate
<i>Callicarpa dichotoma</i>	Purple Beautyberry	Y	Y		Y	Y		Y	FS PS	5.5-7.4	7💧	3-4(to 6) x 3-5, fine-textured, arching stems, dense	Zones 5-8; prefers well-drained soils; adaptable to pH, sun or light shade; cut down to ground periodically to rejuvenate
<i>Callicarpa japonica</i>	Japanese Beautyberry	Y	Y		Y	Y		Y	FS PS	5.5-7.4	7💧	4-6 x 4-6, fine-textured, arching stems, dense	Same as <i>C. dichotoma</i> , above

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Caryopteris xclandonensis</i>	Bluebeard, Blue Spirea, Blue Mist Shrub (species and cultivars)	Y	Y						FS	5.5-6.8	7💧	2-3(to 4) x 2-3, mounding, rounded, full	Zones 6-9; prefers loose, loamy, well-drained soils; adaptable to pH; too much moisture dooms the plant; treat as an herbaceous perennial, cutting back in the autumn
<i>Cercis chinensis</i> 'Avondale', 'Shirobana' ('Alba'), 'Don Engolf', others	Chinese Redbud (low-growing cultivars)	Y	Y		Y	Y		Y	FS PS	5.5-7.4	8💧	8-15 x 6-10, multi-stemmed	Zones 6-9; prefers moist, deep, well-drained soil rich in organic content, but does well in almost all soil conditions, except permanently wet; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Chimonanthus praecox</i>	Fragrant Wintersweet	Y			Y	Y			FS PS	5.5-7.4+	4	10-15 x 8-12, multi-stemmed, fountain-like; leggy with age	Zones 7-9; needs good drainage; adaptable to many soil types and pH; cut back to within six inches of the ground to rejuvenate to restore form when older; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Chionanthus retusus</i>	Chinese Fringetree	Y	Y		Y	Y		Y	FS PS	5.5-7.4	7💧	12-25 x 10-15, multi-stemmed, upright, spreading branches	Zones 6-8; prefers well-drained soils; adaptable to pH and soil types; urban-tolerant, withstands heat and drought; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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Table 2D: Allowed Shrubs, Deciduous, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Cornus alba</i>	Tartarian Dogwood (species and cultivars)	Y				Y		Y	FS PS	5.5-7.5	8💧	4-6(10) x 4-6, erect, arching, open, loose mass of twigs	Zones 3-7; survives much better in the North; suckers to form large colonies and can be invasive; good wet area plant if suckering is not a concern
<i>Corylopsis glabrescens</i>	Fragrant Winterhazel	Y			Y	Y			FS PS	4.5-6.5	4	8-15 x 8-15, spreading, dense, flat-topped, multi-stemmed with zigzag stems	Zones 5-8; needs well-drained, acidic, moist soil, high in organic content; keep well-watered, but no standing water; good drainage is a must; a large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Corylopsis spicata</i>	Spike Winterhazel (species and cultivars)	Y			Y	Y			FS PS	4.5-6.5	4	4-6(to 10) x 6-12, mass of crooked, arching branches	Same as above, but not usually used as a small tree
<i>Corylus avellana</i> 'Henry Lauder's Walkingstick' ('Contorta'), others	European Filbert, Hazelnut	Y	Y		Y	Y		Y	FS PS	5.5-7.4	4	12-20 x 10-15, dense thicket of erect canes and shoots from roots	Zones 4-8; prefers well-drained, loamy soil; adaptable to pH, sun or part shade; location of use is predicated on the mature or maintained height of the plant or cultivar

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Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Cotinus coggygria</i> 'Black Velvet', 'Daydream', 'Flame', 'Royal Purple', 'Velvet Cloak', others	Smokebush	Y	Y		Y	Y		Y	FS PS	5.5-7.4	7 	10-15 x 10-15, upright, spreading, loose, open, multi-stemmed	Zones 5-8; prefers well-drained soils and sunny exposure best; tolerant of pH, soil types, dry conditions, drought; leaf color fades with heat; a large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Cotinus obovatus</i>	American Smoketree	Y	Y		Y	Y		Y	FS PS	5.5-7.4	7 	15-25 x 12-15, large, multi-stemmed	Same as <i>C. coggygria</i> , above; many hybrids with other <i>Cotinus</i> ; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Deutzia gracilis</i>	Slender Deutzia (cultivars and hybrids with other species)	Y	Y		Y	Y			FS PS	5.5-7.4	7 	2-4 x 2-4, low, mounding, with slender branches	Zones 4-8; easy to grow in well-drained garden soil; adaptable to pH, sun or shade, urban conditions, drought-tolerant; rejuvenate by pruning back to 6-12 inches (sacrificing next season's flowers); looks unkempt in winter
<i>Deutzia scabra</i>	Fuzzy Deutzia	Y	Y		Y	Y			FS PS	5.5-7.4	7 	6-10 x 4-8, oval, round-topped, with spreading, slender branches	Zones 5-8; easy to grow in well-drained garden soil; adaptable to pH, sun or shade, urban conditions, drought-tolerant; coarse and unkempt, but reliable flowering

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Enkianthus campanulatus</i>	Red-Vein Enkianthus (species and cultivars)	Y				Y		Y	FS PS	4.5-6.5	4	12-15 x 4-8, narrow, upright, with layered branches, becoming rounded with age	Zones 5-7; prefers moist, acidic, well-drained soil rich in organic content; shallow rooting; needs consistent moisture (but not standing water) in hot weather; can be a large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Exochorda racemosa</i>	Pearlbush	Y			Y	Y			FS PS	5.5-6.2	7💧	10-15 x 10-15, upright, slender-branched, loose, irregular	Zones 4-8; prefers well-drained, acidic, loamy soils; somewhat pH-adaptable; prune low to rejuvenate when becomes floppy and unkempt with age; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Forsythia xintermedia</i>	Forsythia (species and cultivars)	Y	Y			Y			FS	5.5-7.4	7💧	8-10 x 10-12, some cultivars smaller; wild, upright, arching canes	Zones 6-9; prefers good, loose soil, but very tolerant; needs full sun for best flowering; adaptable to pH, urban conditions, and air pollution; prune after flowering; suckering and spreading habit (suckers root where they touch the ground); location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Hamamelis xintermedia</i> 'Arnold Promise', 'Jelena' ('Copper Beauty'), 'Pallida', 'Ruby Glow' ('Adonis', 'Rubra Superba'), 'Winter Beauty', many others	Witchhazel	Y*	Y			Y		Y	FS PS	5.4-6.8	7 	15-20 x 15-20, multi-stemmed, rounded	Zones 6-8; culture like other <i>Hamamelis</i> ; generally hybrids between <i>H. japonica</i> and <i>H. mollis</i> ; LARGE shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Hamamelis mollis</i>	Chinese Witchhazel (species and cultivars)	Y*			Y	Y		Y	FS PS	5.5-6.8	4	15 x 15, spreading branches	Zones 5-8; prefers moist, well-drained soil rich in organic content; leaves scorch in hot summers; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Hamamelis vernalis</i>	Vernal Witchhazel (species and cultivars)	Y*	Y		Y	Y		Y	FS PS	5.5-7.4	8 	6-10 x 6-10+, dense, multi-stemmed, rounded	Zones 4-8; prefers moist situations; found going in gravelly steam banks.; grows well in heavier, wet clays; pH-adaptable; will sucker and form colonies
<i>Hibiscus syriatus</i>	Rose of Sharon, Althea	Y	Y		Y				FS PS	5.5-7.4	8 	8-12 x 6-10, can get bigger; loose	Zones 5-9; very tolerant of conditions, growing in any but extremely wet or dry conditions; pH-tolerant; prefers hot weather; leave as shrub or prune into a small, multi-stemmed tree; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Hydrangea anomala petolaris</i>	Climbing Hydrangea	Y			Y				FS PS SH	5.5-7.4	1	10-80 x 10-40, climbing vine	Zones 4-8; prefers moist, well-drained soil rich in organic content; best on eastern or northern exposure with regular moisture in hotter climates; able to cover tall trees and large structures
<i>Hydrangea macrophylla</i>	Bigleaf Hydrangea (species and cultivars, including mop-heads and lacecaps)	Y	Y		Y				FS PS SH	5.0-6.8	1	3-6+ x 3-6+, coarse, rounded with many erect stems	Zones 6-9; prefers moist, well-drained soil rich in organic content; partial shade or shade, and regular moisture in hotter climates; salt-tolerant, good urban-tolerance; best blue color in acidic (pH = 5.0-5.5) soils, best pink in more neutral (pH = 6.0-6.5) soils; flowers on previous season’s growth, so prune after flowering
<i>Hydrangea paniculata</i>	Panicle Hydrangea (species and cultivars)	Y	Y		Y				FS PS SH	5.5-6.8	4	4-8 (to 20) x 4-8+, upright, coarse, low-branched	Zones 3-9; prefers moist, well-drained soil rich in organic content; good urban-tolerance; flowers on new wood, so can be pruned in winter or early spring; a tough plant; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Hydrangea quercifolia</i>	Oakleaf Hydrangea (species and cultivars)	Y	Y		Y	Y			FS PS SH	5.5-7.4+	4	4-8 (to 12+) x 6-12, upright, coarse, irregularly rounded	Zones 6-9; prefers moist, well-drained soil rich in organic content; mulch to keep roots moist; good urban-tolerance; native to limestone soils in lower South; “deer candy”; forming colonies via stolons; location of use is predicated on the mature or maintained height of the plant or cultivar

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<i>Kerria japonica</i>	Japanese Kerria	Y	Y		Y	Y		Y	PS SH	5.5-7.4	7💧	5-9 x 5-9, distinctly upright, arching stems form dense, rounded, twiggy mass	Zones 5-9; needs loamy, well-drained soil; adaptable to pH and soil conditions; better flowering with lower soil fertility; tends to sucker and spread (colonize) faster in looser soils; flowers face more quickly in full sun; becoming more open with age
<i>Kolkwitzia amabilis</i>	Beautybush	Y	Y		Y	Y			FS PS	5.5-7.4	7💧	6-10 x 4-8, upright, arching, vase-shaped	Zones 4-8; prefers well-drained soils, but is adaptable to soils types and pH; cut to ground to rejuvenate (flowers on older wood, so will lose the season’s flowers); leggy and more coarse with age
<i>Laburnum xwatereri</i>	Goldenchain Tree	Y*			Y	Y			PS	5.5-7.4	4	12-15 x 9-12, upright oval-rounded, loses lower branches	Zones 5-7; prefers moist, well-drained soils; pH-tolerant, but no standing water; not very heat-tolerant and does not perform as well in the South; eastern or northern exposure best with shade in the hot part of the day; small tree or large shrub; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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						Constructed	Solid Hedge	Riparian					
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> 'Cascading Pink Lady', 'Orchid Cascade', 'Rosey Carpet'	Dwarf Crapemyrtle (lowest-growing cultivars)	Y	Y	Y		Y			FS	5.5-7.4	7💧	1-3 x 2-6, full rounded, dense	Zones 6-9; prefers well-drained soils; very pH- and soil-adaptable; needs full sun; must be maintained at 30 inches in height to use in sight distance triangles
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> 'Centennial', Chica™ series, 'Chickasaw', 'Hope', 'Ozark Spring', 'Pocomoke', 'Prairie Lace', 'Velma's Royal Delight', 'Victor', some of the Dixie™, Petite™, 'Pixie', and Razzle Dazzle® series, others	Dwarf Crapemyrtle	Y	Y	Y		Y			FS	5.5-7.4	7💧	1-5 x 2-6, full rounded, dense	Zones 6-9; prefers well-drained soils; very pH- and soil-adaptable; needs full sun
<i>Lagerstroemia indica</i> and <i>L. indica</i> x <i>L. fauriei</i> 'Acoma', 'Centennial Spirit', 'Comanche', 'Hopi', 'Osage', 'Pecos', 'Pink Lace', 'Potomac', 'Powhatan', 'Seminole', 'Tonto', 'Zuni', some of the 'Dixie'™ and 'Pixie' series, others	Crapemyrtle (semi-dwarf)	Y	Y			Y			FS	5.5-7.4	7💧	6-12 x 6-12, full, rounded, dense-flowering	Same as above; often multi-stemmed large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar

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Table 2D: Allowed Shrubs, Deciduous, Not Native to NC Piedmont		Requirements							Recommended Cultural Information				
Scientific Name	Common Name	Approved Location of Use Categories ¹							Planting Conditions			Mature Height x Spread (in Feet) and Form	Cultural Notes
		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Lespedeza thunbergii</i>	Thunberg Lespedeza	Y			Y	Y		Y	FS PS	5.5-7.4	7 	3-6 x 3-6, graceful, arching fountain	Zones 5-8; best in well-drained soil, but is soil-, pH-, and heat-tolerant; often dies back to ground in winter in Zone 7
<i>Lindera obtusifolium</i>	Japanese Spicebush	Y			Y	Y		Y	FS PS	5.5-6.8	5	8-10+ x 8-10+, rounded, dense	Zones 6-7; moist, acidic, well-drained soils; adaptable to drier soils, but best performance in moist conditions and half-shade; multi-stemmed shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Magnolia</i> 'Jane' (<i>M. liliiflora</i> 'Nigra' x <i>M. stellata</i> 'Rosea'), other related 'girls' such as 'Ann', 'Betty', etc.	'Little Girl' Hybrid Magnolias	Y	Y			Y			FS PS	5.5-6.8	5	10-15 x 8-12, upright, broad-rounded	Zones 4-7; prefers well-drained soils; foliage tends to be mildew-susceptible and look tattered toward end of summer; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Magnolia xloebneri</i> 'Ballerina', 'Leonard Messel', 'Merrill', 'Spring Snow', many others	Hybrid Star Magnolia, Loebner Magnolia	Y	Y			Y			FS PS	5.5-6.8	5	12-25 x 15-30, upright, broadly-rounded	Zones 4-7; prefers well-drained soils; little mildew effect on leaves; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Magnolia xsoulangeana</i>	Saucer Magnolia (species and cultivars)	Y	Y			Y			FS PS	5.5-6.8	5	18-25 x 15-20, upright, pyramidal to rounded	Zones 4-9; prefers deep, well-drained soils rich in organic content; not as cold-hardy as other deciduous magnolias; best in east, northeast exposures (protects flowers best); pollution-tolerant; a large shrub or low-branched, multi-stemmed small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Magnolia stellata</i> ‘Centennial’, ‘Pink Stardust’, ‘Rosea’, ‘Royal Star’, ‘Waterlily’, many others	Star Magnolia (species and cultivars)	Y	Y			Y			FS PS	5.5-6.8	5	15-20 x 10-15, dense, oval to rounded	Zones 4-9; prefers well-drained soil rich in organic content; avoid southern exposures (like other deciduous magnolias) to protect from early flowers being damaged by cold; pollution-tolerant; does well in heat; a large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Philadelphus coronarius</i> (plus many cultivars with other <i>Philadelphus</i> species and hybrids such as <i>P. xlemoinei</i> , <i>P. lewisii</i> , <i>P. xvirginalis</i>)	Sweet Mockorange	Y	Y			Y			FS PS	5.5-7.4	7💧	10-12 x 10-12, large, rounded, with stiff, upright branches	Zones 4-8; prefers moist, well-drained soil rich in organic content, but generally tolerant of soil conditions; vigorous and easy to grow; many cultivars with other <i>Philadelphus</i> species; leggy and straggly with age; location of use is predicated on the mature or maintained height of the plant or cultivar

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


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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Punica granatum</i>	Pomegranate	Y	Y						FS PS	5.5-7.4	7 	12-20 x 10-15, upright oval to rounded	Zones 7-10; does better further South; best in fertile, moist, well-drained soils, but with good drainage is very adaptable to soil type, and pH; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron prunifolium</i>	Plumleaf Azalea	Y*			Y	Y		Y	PS SH	4.5-6.8	4	8-12 x 4-8, loose, open, graceful	Zones 5-8; prefers well-drained, moist, acid soils; native to shady stream banks; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhododendron serrulatum</i>	Sweet Azalea	Y*			Y	Y		Y	PS SH	4.5-6.8	5	6-12 x 6-12, rounded outline, loose and open	Zones 7-9; needs constantly moist, well-drained, acid soils; native to swampy woods; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Rhodotypus scandens</i>	Black Jetbead	Y	Y		Y	Y			FS PS SH	5.5-7.4	7 	3-6 x 4-9, mounded with arching branches	Zones 4-8; tolerant of a wide range of conditions, including soil type, pH, pollution and shade; good plant for dry shade; good parking lot tolerance; sometimes scraggly

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Rosa rugosa</i>	Rugosa Rose (species and cultivars)	Y	Y			Y			FS	5.5-6.8	7 	4-6 x 4-6, thorny, stout, upright stems with rounded habit	Zones 2-8; prefers well-drained, slightly acid soil, supplemented with organic matter; salt-tolerant, urban conditions, will grow in sand; watch location due to thorns; suckers and forms colonies
<i>Rosa</i> hybrids ‘The Fairy’, Alba Meidiland™ ((Meiflopan’), Fuchsia Meidiland™ (‘Meipelta’), Red Meidiland™ (‘Meineble’), ‘Seafoam’, White Meidiland™ (‘Meicoublan’), others	Rose (low-growing, lower maintenance cultivars)	Y	Y	Y					FS	5.5-6.8	7 	2-4 x 2-6, spreading, ground-cover, dense	Zones 4-8; prefers moist, well-drained, slightly acidic soil rich in organic content; tolerant of salt and urban conditions; good disease-resistance; however, Meidiland™ series, especially, and some others should be monitored for black spot and mildew
<i>Rosa</i> hybrids Bonica™ (‘Meidomonac’), Carefree Spirit™ (‘Meizma’), Knock Out® series, ‘Nearly Wild’, Scarlet Meidiland™ (‘Meikrotal’), others	Rose (medium-height, lower maintenance cultivars)	Y	Y			Y			FS	5.5-6.8	7 	3-5 x 3-6, spreading, rounded, tall ground-cover	Same as above

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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Spiraea xbumalda</i> and <i>S. japonica</i> hybrids var. <i>alpina</i> ('Alpina', 'Nana'), 'Coccinea', 'Crispa', 'Gold Flame', 'Gold Mound' ('Goldmound'), 'Little Princess', Magic Carpet™ ('Walbuma'), 'Neon Flash', many others	Bumald and Japanese Spirea Hybrids (lowest-growing cultivars)	Y	Y	Y	Y				FS PS	5.5-7.4	7 	2-2.5 x 2-5, dense, fine textured, rounded, mounding	Zones 4-8; best in fertile, well-drained soil, but very tolerant of soil and pH conditions (except wet soils); generally good heat- and pollution-tolerance; only those less than 30 inches tall at maturity can be planted within sight distance triangles; species not allowed due to invasive tendencies
<i>Spiraea xbumalda</i> and <i>S. japonica</i> hybrids var. 'Anthony Waterer', 'Genpei' ('Shirobana', 'Shibori'), many others	Bumald and Japanese Spirea Hybrids (medium-height cultivars)	Y	Y		Y				FS PS	5.5-7.4	7 	2-5 x 2-5, dense, fine textured, rounded, mounding	Same as above
<i>Spiraea cantoniensis</i> 'Flore Pleno' ('Lanceata')	Double Reeves Spirea	Y	Y		Y	Y			FS PS	5.5-7.4	7 	4-6 x 4-6, graceful, arching, dense, rounded	Zones 4-9; best in fertile, well-drained soil, but very tolerant of soil and pH conditions (except wet soils); good heat- and pollution-tolerance
<i>Spiraea nipponica</i> 'Snowmound'	Snowmound Nippon Spirea	Y	Y		Y				FS PS	5.5-7.4	7 	3-6 x 4-8, dense, arching, rounded	Zones 3-7; otherwise same as <i>S. cantoniensis</i>

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
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						Constructed	Solid Hedge	Riparian					
<i>Spiraea thunbergii</i>	Thunberg Spirea	Y	Y		Y				FS PS	5.5-7.4	7💧	3-5 x 3-5, bushy, spreading, arching	Zones 4-9; otherwise same as <i>S. cantoniensis</i>
<i>Spiraea xvanhouttei</i> (<i>S. trilobata</i> x <i>S. cantoniensis</i>) 'Renaissance', 'Snow White' (<i>S. trilobata</i> x <i>S. trichocarpa</i>)	Vanhoutte Spirea (hybrid and cultivars)	Y	Y		Y	Y			FS PS	5.5-7.4	7💧	6-10 x 10-12, vase / fountain-like habit with rounded top	Zones 3-9; culture same as <i>S. xbumalda</i> , above; Newer cultivars have better form and disease resistance than original.
<i>Viburnum xcarlcephalum</i> (<i>V. carlesii</i> x <i>V. macrocephalum</i> var. <i>keteleeri</i>), 'Cayuga', 'Chesapeake', 'Eskimo'	Fragrant or Carlcephalum Viburnum (this hybrid and cultivars)	Y	Y		Y				FS PS	6.3-6.8	4	6-10(15) x 6-10(14), open, loose, upright, rounded	Zones 5-8; prefers deep, fertile, well-drained, moist, slightly acid soils; needs even moisture; it forms a fast-growing, large shrub; adaptable to high pH; popular garden Viburnum; fragrant blooms; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum carlesii</i>	Koreanspice Viburnum (species and cultivars)	Y	Y		Y				FS PS	6.3-6.8	4	4-5 (to 8) x 4-8, rounded, dense with upright spreading branches	Zones 4-8; prefers well-drained, slightly acid soils with even moisture; adaptable to high pH; recommend buying own-root plants instead of plants grafted onto <i>V. lantana</i> understock, which will take over the entire plant; fragrant blooms

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
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		Urban Conditions	Vehicle Use Areas	Sight-Distance Triangles	Under Tree Coverage	Buffers			Sun Exposure ³	pH Range ⁴	Wet/Dry and Soil Tolerance ⁵		
						Constructed	Solid Hedge	Riparian					
<i>Viburnum dilatatum</i>	Linden Viburnum (species and cultivars)	Y	Y		Y				FS PS	6.3-6.8	4	8-10 x 6-8, open, loose, upright, rounded	Zones 5-8; prefers well-drained, moist, slightly acid soils; needs even moisture; adaptable to high pH; needs good moisture and cool locations in Zones 7-8; flowers are significantly malodorous; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum macrocephalum</i>	Chinese Snowball Viburnum	Y	Y		Y				FS PS	6.3-6.8	4	6-10(12) x 6-10, open, loose, upright, rounded	Zones 6-9; semi-evergreen in the South; prefers well-drained, moist, slightly acid soils; needs even moisture; adaptable to high pH; flowers non-fragrant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Viburnum opulus</i>	European Cranberrybush Viburnum (species and cultivars)	Y	Y		Y				FS PS	6.3-6.8	4	8-12 (to 15) x 10-15, upright, multi-stemmed, spreading	Zones 3-8; prefers well-drained, moist, slightly acid soils; needs even moisture; adaptable to high pH; found in swamps and bog in its native habitat; easy to grow; flowers slightly malodorous, but not generally noticeable; location of use is predicated on the mature or maintained height of the plant or cultivar

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						Constructed	Solid Hedge	Riparian					
<i>Viburnum plicatum</i> f. <i>tomentosum</i> 'Mariesii', 'Pink Beauty', 'Shasta', 'Shoshoni', 'Summer Snowflake' ('Fujisanensis', 'Mt. Fuji'), many others	Doublefile Viburnum	Y	Y		Y				FS PS	6.3-6.8	4	8-12 (to 15) x 10-15, multi-stemmed spreading	Zones 5-8; prefers well-drained, moist, slightly acid soils; needs even moisture; will not tolerate wet, poorly drained, clay soils; needs mulch and regular (but well-drained) moisture in the South; large shrub or small tree; flowers non-fragrant; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Vitex agnus-castus</i>	Lilac Chastetree	Y	Y		Y	Y			FS PS	5.8-6.8	7💧	15-20 x 15-20, loose, airy, open, multi-stemmed	Zones 7-9; prefers loose, well-drained soil, full sun, and hot weather; will sucker and water-sprout from stem and trunk, especially when pruned, making it look unkempt; grows in sand in the Coastal Plain; salt-tolerant; large shrub or small tree; location of use is predicated on the mature or maintained height of the plant or cultivar
<i>Vitex negundo</i>	Chinese Chastetree	Y	Y		Y	Y			FS PS	5.8-6.8	7💧	10-15 x 10-15, loose, airy, open, multi-stemmed	Zones 6-8; prefers loose, well-drained soil, full sun, and hot weather; large shrub or small tree; more cold-tolerant than <i>V. agnus-castus</i> ; location of use is predicated on the mature or maintained height of the plant or cultivar

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
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						Constructed	Solid Hedge	Riparian					
<i>Weigela florida</i> ‘Dark Horse’, ‘Evita’, Fine Wine™ (‘Bramwell’), Magical® (‘Kolsunn’), ‘Minuet’, Pink Poppet™ (‘Plangen’), ‘Ruby Queen’, ‘Rumba’, ‘Samba’, ‘Tango’, ‘Variegata Nana’	Dwarf Weigela (very low cultivars)	Y	Y	Y	Y				FS	5.8-6.8	5	2-3 x 3-5, spreading, dense	Zones 6-9; prefers loose, well-drained soil, full sun (does not do well in shade); very adaptable to soil conditions; heat- and pollution-tolerant; will succumb to extended drought
<i>Weigela florida</i> Carnaval™ (‘Courtalor’), ‘Dart’s Colordream’ (‘Colourdream’), ‘Eva Supreme’, ‘Gold Rush’, ‘Java Red’, ‘Red Trumpet’, Wine & Roses® (‘Alexandra’)	Weigela (low to medium height cultivars)	Y	Y		Y	Y			FS	5.8-6.8	5	4-5 x 4-5, spreading, dense	Same as above
<i>Weigela florida</i>	Weigela (species and taller cultivars)	Y	Y		Y	Y			FS	5.8-6.8	5	6-9 x 6-12, spreading, dense	Same as above

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**Table 3, Trees Not Allowed for Ordinance-Required Planting Credit
(Exceptions are Noted within the Allowed Plant Tables)**

Latin Name, Common name	Where Not Allowed for Credit	Native or Exotic	Reasons for Concern
<i>Acer rubrum</i> , 'Armstrong', Armstrong columnar red maple	All uses	Native	Weak-wooded and prone to storm damage
<i>Acer saccharinum</i> , Silver maple	All uses	Exotic	Weak-wooded and prone to storm damage, very vigorous roots and disease-prone
<i>Acer platanoides</i> , Norway maple	All uses	Exotic	Invasive tendencies
<i>Carpinus betulus</i> , European Hornbeam species	All uses	Exotic	Species is more successful north of Zone 7; not typically available in trade
<i>Broussonetia papyrifera</i> , Paper mulberry	All uses	Exotic	Invasive tendencies
<i>Cinnamomum camphora</i> , Camphortree	All uses	Exotic	Invasive tendencies
<i>Cornus florida</i> , Dogwood	Street trees and parking lots	Native	Generally does not do well in full sun or hot areas; should be planted at the edge of a canopy of trees or the north side of a building that provides shade; subject to <i>Anthraxnose</i>
<i>Crataegus</i> spp., Hawthorns	All uses	Exotic	Many insect and disease problems; generally don't fare well in the South
<i>Fraxinus americana</i> , White ash	All uses	Native	Many disease and insect problems
<i>Juglans nigra</i> , Black Walnut	For all new plantings; existing, protected trees allowed in appropriate locations	Native	Although a handsome tree, does not allow anything else to grow under or around it (allelopathic)
<i>Liquidambar styraciflua</i> , Sweetgum (species)	Street trees and parking lots	Native	Not a specimen tree; fruit is generally a nuisance around buildings and over streets and parking lots
<i>Malus</i> spp., Apples and Crabapples, (some cultivars better – see Tables of Allowed Trees, above)	All uses	Exotic	Many insect and disease problems; excessive suckering is unattractive; fruit may be a nuisance around buildings and over streets and parking lots
<i>Morus</i> spp. (Mulberries)	All uses	Exotic	Excessive suckering is unattractive; fruit may be a nuisance in parking lots, streets and around buildings; <i>Morus papyrifera</i> and <i>M. alba</i> have invasive tendencies
<i>Pyrus</i> spp. (Pears)	All uses	Exotic	Weak-wooded and sharp branch angles contribute to storm damage and broken trees; short-lived; (<i>Pyrus calleryana</i> 'Bradfordii' and similar trees are an example); <i>P. calleryana</i> has invasive tendencies
<i>Pinus echinata</i> , Shortleaf pine	Street trees and parking lots	Native	Shallow-rooted; prone to wind throw, storm damage and Southern Pine Beetle
<i>Pinus palustris</i> , Longleaf pine	Street trees, parking lots, and any use in clay soils	Exotic	Native to NC Coastal Plain, but not Piedmont; requires very sandy soil to grow

**Table 3, Trees Not Allowed for Ordinance-Required Planting Credit
(Exceptions are Noted within the Allowed Plant Tables)**

Latin Name, Common name	Where Not Allowed for Credit	Native or Exotic	Reasons for Concern
<i>Pinus strobus</i> , Eastern white pine	All uses	Exotic	Native to NC Mountains but not Piedmont; frequently dies suddenly in “hot spells” when 15-20 years old
<i>Platanus occidentalis</i> , Sycamore	All uses, except in riparian buffers	Native	Litter a nuisance around buildings, streets and parking lots; sycamore leaf scorch and anthracnose are becoming significant problems which are difficult to impossible to treat
<i>Populus alba</i> , White poplar, Silver-leaf poplar	All uses	Exotic	Brittle wood (storm damage), roots clog drains, maintenance issues due to pests and diseases, invasive tendencies
<i>Populus balsamifera</i> ssp.; <i>balsamifera</i> , Balsam poplar or balm of Gilead	All uses	Exotic	Invasive tendencies
<i>Prunus</i> spp., Cherries and plums	All uses	Exotic	Short-lived; seems to be too hot for them here; many insect and disease problems; see recommended list for exceptions
<i>Quercus acutissima</i> , Sawtooth oak	All uses	Exotic	Invasive tendencies
<i>Quercus nigra</i> , Water oak	Street trees and parking lots	Native	Problems with untreatable decay
<i>Quercus palustris</i> , Pin or Swamp oak	Parking lots or street trees	Exotic	Iron chlorosis and bacterial scorch are common and difficult to treat; persistent branches (may be limbed up) and leaves
<i>Quercus virginiana</i> , Live oak	All uses	Exotic	Native to NC Coastal Plain, but not Piedmont; too cold at times in winter to do well here
<i>Robinia pseudoacacia</i> , Black locust	All uses except re-populating disturbed riparian buffers	Exotic	Prone to disease and decay; use along stream buffers should be limited to a minority of plantings as well, or it can take over
<i>Tilia cordata</i> cultivars (e.g. ‘Greenspire’), Greenspire linden	All uses	Exotic	Littleleaf linden cultivars are not hardy here and develop problems with <i>Botryospheria</i> canker, which can’t be treated; <i>Tilia cordata</i> (species) is a better choice
<i>Tsuga canadensis</i> , Eastern hemlock	All uses	Exotic	Too hot for them here
<i>Ulmus</i> spp., Elms, except those listed in the Tables of Allowed Trees, above	All uses	Exotic	Many disease and insect problems, including Dutch Elm Disease; some of the new <i>Ulmus</i> x – named cultivars, and <i>Ulmus parvifolia</i> are exceptions
Notes: From City of Durham, General Services Department, Urban Forestry Division, and from “Invasive exotic plants to avoid in the southeastern United States”, compiled for the North Carolina Botanical Garden by Allison Schwartz and Johnny Randall, Spring, 1999.			

Table 4, Other Plants Not Allowed for Ordinance-Required Planting Credit

Scientific Name	Common Name	Reasons for Concern
<i>Ajuga reptans</i>	Bugleweed, common bugle	Invasive tendencies
<i>Akebia quinata</i>	Chocolate vine, fiveleaf akebia	Invasive tendencies
<i>Alliaria officianalis</i> ; <i>A. petiolata</i>	Garlic mustard	Invasive tendencies
<i>Allium vineale</i>	Wild garlic, field or crow garlic	Invasive tendencies
<i>Alnus serrulata</i>	Common alder	May colonize moist areas to the detriment of other plants
<i>Ampelopsis heterophylla</i>	Amur peppervine, porcelain-berry	Invasive tendencies; (see <i>A. brevipedunculata</i> on prohibited list)
<i>Arrhenatherum elatius</i>	Alligatorweed	Invasive tendencies
<i>Artemisia vulgaris</i>	Common wormwood, mugwort	Invasive tendencies
<i>Berberis thunbergii</i> and cultivars	Japanese barberry	Invasive tendencies
<i>Buxus microphylla</i> 'Compacta'	Littleleaf boxwood	Many diseases
<i>Buxus sempervirens</i> 'Arborescens'	Tree boxwood	Too hot here for this plant
<i>Cardiospermum halicacabum</i>	Balloon vine, love in a puff	Invasive tendencies
<i>Carduus vulgaris</i> (see <i>Cirsium vulgare</i>)		Invasive tendencies
<i>Carex kobomugi</i>	Japanese or Asiatic sand sedge	Invasive tendencies
<i>Cassia obtusifolia</i> (see <i>Senna obtusifolia</i>)		Invasive tendencies
<i>Ceanothus americanus</i>	New Jersey Tea	Doesn't do well in humid conditions or in heavy soils; difficult to transplant
<i>Chaenomeles japonica</i>	Japanese flowering quince	Unkempt, thorny; leaf spots and abundant spring and early summer rainfall result in premature defoliation
<i>Chrysanthemum leucanthemum</i> (see <i>Leucanthemum vulgare</i>)		Invasive tendencies
<i>Centaurea biebersteinii</i>	Spotted knapweed	Invasive tendencies
<i>Clematis terniflora</i>	Leatherleaf clematis, sweet autumn virgin's bower	Invasive tendencies
<i>Commelina communis</i>	Common dayflower	Invasive tendencies
<i>Comptonia peregrina</i>	Sweet fern	Too hot here
<i>Cornus sericea</i> ; <i>C. stolonifera</i> and 'Flaviramea'	Redosier dogwood, yellow-twig dogwood	Freely spreading by underground stems, many diseases; considered potentially invasive
<i>Coronilla varia</i>	Crown vetch	Invasive tendencies
<i>Cotoneaster apiculatus</i>	Cranberry cotoneaster	Prefers colder climates
<i>Cytisus scoparius</i>	Scotch broom	Short-lived; many diseases
<i>Diervilla sessilifolia</i>	Southern bush-honeysuckle	Native honeysuckle that suckers to form colonies and may take over
<i>Dipsacus fullonum</i> ; <i>D. fullonum sylvestris</i> ; <i>D. laciniatus</i> ; <i>D. sylvestris</i>	Fuller's teasel; common or wild teasel; cutleaf teasel	Invasive tendencies
<i>Egeria densa</i>	Brazilian waterweed, elodea	Invasive tendencies
<i>Eleutherococcus pentaphyllus</i>	Ginseng shrub, five-leaf aralia	Invasive tendencies
<i>Elodea densa</i> (see <i>Egeria densa</i>)		Invasive tendencies
<i>Eragrostis curvula</i>	Weeping lovegrass	Invasive tendencies
<i>Euphorbia esula</i>	Leafy spurge, wolf's milk	Invasive tendencies

Table 4, Other Plants Not Allowed for Ordinance-Required Planting Credit

Scientific Name	Common Name	Reasons for Concern
<i>Festuca arundinacea</i> ; <i>F. elatior</i> ; <i>Lolium arundinacea</i>	Tall fescue, meadow fescue, Kentucky 31™ fescue	Invasive tendencies, especially in wet (riparian) growing conditions
<i>Foeniculum vulgare</i>	Sweet fennel	Invasive tendencies
<i>Glechoma hederacea</i>	Groundivy	Invasive tendencies
<i>Hedera helix</i>	English ivy	Invasive tendencies; allowed for use in the Urban, Compact and Downtown Tiers for screening purposes
<i>Hesperis matronalis</i>	Dames rocket	Invasive tendencies
<i>Hydrilla verticillata</i>	Waterthyme	Invasive tendencies
<i>Imperata cylindrical</i> ; <i>I. arundinacea</i>	Cogongrass	Invasive tendencies
<i>Ipomoea coccinea</i> ; <i>I. hederacea</i> ; <i>I. purpurea</i>	Red or redstar, ivyleaf and common or tall morning glory	Invasive tendencies
<i>Iris pseudacorus</i>	Yellow flag or pale yellow iris	Invasive tendencies
<i>Lapsana communis</i>	Common nipplewort	Invasive tendencies
<i>Ligustrum obtusifolium</i>	Border or blunt-leaved privet	Invasive tendencies
<i>Lonicera standishii</i>	Standish's honeysuckle	Invasive tendencies
<i>Lotus corniculatus</i>	Birdsfoot deervetch or birdsfoot trefoil	Invasive tendencies
<i>Ludwigia uruguayensis</i>	Primrosewillow or hairy water-primrose	Invasive tendencies
<i>Lyonia ligustrina</i> ; <i>L. lucida</i>	Northern maleberry; shining fetterbush	Arching suckers; weak growth; leaf spot; intolerant of stress
<i>Lysimachia nummularia</i>	Moneywort or creeping Jenny	Invasive tendencies
<i>Lytrum salicaria</i> ; <i>L. virgatum</i>	Purple loosestrife; European wand loosestrife	Invasive tendencies – very invasive in New England
<i>Mahonia bealei</i>	Oregon holly-grape	Invasive tendencies
<i>Melilotus alba</i>	White sweet clover	Invasive tendencies
<i>Mosla dianthera</i>	Miniature beefsteak	Invasive tendencies
<i>Murdannia keisak</i>	Asian spiderwort or aneilima	Invasive tendencies
<i>Myriophyllum aquaticum</i> ; <i>M. spicatum</i>	Parrotfeather watermilfoil; European or spike watermilfoil	Invasive tendencies
<i>Nasturtium officinale</i> (see <i>Rorippa nasturtium officinale</i>)		Invasive tendencies
<i>Panicum repens</i>	Torpedo grass	Invasive tendencies
<i>Paspalum urvillei</i>	Vasey's grass	Invasive tendencies
<i>Pastinaca sativa</i>	Wild parsnip	Invasive tendencies
<i>Perilla frutescens</i>	Beefsteak plant	Invasive tendencies
<i>Phalaris arundinacea</i>	Reed canarygrass	Invasive tendencies
<i>Phragmites australis</i>	Common reed	Invasive tendencies
<i>Picea omorika</i> and dwarf cultivars	Serbian spruce	Prefers deep, rich, moist, well-drained soils; more heat-tolerant than most spruces, but subject to borers, aphids and budworms
<i>Pittosporum tobira</i>	Japanese pittosporum	Too cold here (Zone 8b best)
<i>Podocarpus macrophyllus</i> var. <i>maki</i>	Shrubby podocarpus	Marginally hardy here

Table 4, Other Plants Not Allowed for Ordinance-Required Planting Credit

Scientific Name	Common Name	Reasons for Concern
<i>Polygonum cespitosum</i> ; <i>P. cuspidatum</i> ; <i>P. perfoliatum</i> ; <i>P. sachalinense</i>	Bunchy knotweed or oriental ladythumb; Japanese knotweed; Mile-a-minute; giant knotweed	Invasive tendencies
<i>Potamogeton crispus</i>	Curly pondweed	Invasive tendencies
<i>Prunus glandulosa</i>	Flowering almond	<i>Prunus</i> species not recommended due to diseases; weak, straggly
<i>Pseudosasa japonica</i>	Arrow bamboo	Invasive tendencies
<i>Ranunculus ficaria</i>	Lesser celandine or fig buttercup	Invasive tendencies
<i>Raphanus raphanistrum</i>	Wild radish or jointed charlock	Invasive tendencies
<i>Rhamnus alnus</i> ; <i>R. cathartica</i> ; <i>R. frangula</i>	Glossy buckthorn; common buckthorn	Invasive tendencies
<i>Rhus typhina</i>	Staghorn sumac	Suckering to form colonies; should not be used widely
<i>Rorippa nasturtium-aquaticum</i>	Watercress	Invasive tendencies
<i>Rubus phoenicolasius</i>	Wineberry or wine raspberry	Invasive tendencies
<i>Rumex acetosella</i>	Red sorrel or common sheep sorrel	Invasive tendencies
<i>Ruscus aculeatus</i>	Butcher's broom	Not hardy in Durham
<i>Sabal minor</i>	Dwarf palmetto	Not hardy in Durham
<i>Senna obtusifolia</i>	Coffeeweed or sicklepod	Invasive tendencies
<i>Setaria faberi</i> ; <i>S. pumila</i> ; <i>S. viridis</i>	Japanese bristlegrass or giant foxtail; yellow bristlegrass or smooth millet; green bristlegrass or green millet	Invasive tendencies
<i>Sorghum halepense</i>	Johnsongrass	Invasive tendencies
<i>Spiraea japonica</i>	Japanese meadowsweet	Invasive tendencies
<i>Spiraea prunifolia</i>	Bridalwreath spirea	Straggly, open, coarse, with foliage on upper 50% of the plant
<i>Stellaria media</i>	Common chickweed	Invasive tendencies
<i>Syringa oblata</i> var. <i>dilatata</i> ; <i>S. vulgaris</i>	Korean lilac, common lilac	Too hot here for them
<i>Syringa pekinensis</i>	Peking lilac	Many diseases
<i>Tamarix ramosissima</i>	Saltcedar	Invasive tendencies
<i>Torilis arvensis</i>	Hedge-parsley	Invasive tendencies
<i>Trapa natans</i>	Water chestnut	Invasive tendencies
<i>Tribulus terrestris</i>	Puncturevine	Invasive tendencies
<i>Tussilago farfara</i>	Coltsfoot	Invasive tendencies
<i>Verbascum thapsus</i>	Common mullein	Invasive tendencies
<i>Veronica hederaefolia</i>	Speedwell, ivyleaf	Invasive tendencies
<i>Viburnum dilitatum</i>	Arrowwood, linden	Invasive tendencies
Note: Invasive plants taken from "Invasive exotic plants to avoid in the southeastern United States", compiled for the North Carolina Botanical Garden by Allison Schwartz and Johnny Randall, Spring, 1999.		

Table 5, Plants Prohibited for Any Use

Scientific Name	Common Name
<i>Ailanthus altissima</i>	Tree of Heaven
<i>Albizia julibrissin</i>	Mimosa
<i>Allaria petiole</i>	Garlic mustard
<i>Arundo donax</i>	Giant reed
<i>Ampelopsis brevipedunculata</i>	Porcelain-berry, Amur peppervine
<i>Celastrus orbiculatus</i>	Oriental bittersweet
<i>Dioscorea bulbifera</i> ; <i>D. oppositifolia</i> (formerly <i>D. batatas</i>); <i>D. alata</i>	Climbing yam, air potatoes, Chinese yam, water yam
<i>Elaeagnus angustifolia</i> ; <i>E. pungens</i> ; <i>E. umbellata</i>	Russian, autumn and thorny olive
<i>Euonymus alata</i>	Burning bush, winged euonymus, wahoo
<i>Euonymus fortunei</i>	Winter creeper, climbing euonymus, gaiety
<i>Lespedeza bicolor</i> ; <i>L. cuneata</i> (see <i>Sericea lespedeza</i>)	Shrubby lespedeza, bicolor lespedeza, shrub bushclover, bicolor, Chinese lespedeza
<i>Ligustrum japonicum</i> ; <i>L. lucidum</i> ; <i>L. sinense</i> ; (<i>L. villosum</i>); <i>L. vulgare</i>	Common, Japanese, Glossy, European and Chinese privet
<i>Lonicera maackii</i> ; <i>L. morrowii</i> ; <i>L. tatarica</i> ; <i>L. fragrantissima</i> ; <i>L. xbella</i> (hybrid Morrows and Tatarian)	Bush honeysuckles (Amur, Morrow's, Tatarian, Sweet-breath-of-spring, Bell's)
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lygodium japonicum</i>	Japanese climbing fern
<i>Melia azedarach</i>	Chinaberry
<i>Microstegium vimineum</i>	Japanese stilt grass --wind/water dispersed
<i>Miscanthus sinensis</i>	Chinese silvergrass
<i>Nandina domestica</i> species and cultivars with berries: 'Harbor Belle', 'Harbour Dwarf', 'Monum', 'Wood's Dwarf'	Sacred bamboo, nandina
<i>Paulownia tomentosa</i>	Princess tree
<i>Phyllostachys aurea</i> ; <i>P. spp.</i> ; and <i>Bambusa spp.</i>	Golden bamboo and other invasive bamboos
<i>Pueraria montana</i> var. <i>lobata</i> ; <i>P. lobata</i>	Kudzu
<i>Rosa multiflora</i> ; <i>R. bracteata</i> ; <i>R. laevigata</i>	Multiflora, McCartney and Cherokee roses
<i>Sericea lespedeza</i> (see <i>Lespedeza bicolor</i> and <i>L. cuneata</i>)	
<i>Solanum viarum</i>	Tropical soda apple
<i>Triadica sebifera</i> (<i>Sapium sebiferum</i>)	Tallowtree, Popcorn tree
<i>Vinca minor</i> ; <i>V. major</i>	Periwinkles
<i>Wisteria floribunda</i> ; <i>W. sinensis</i>	Japanese and Chinese wisteria
Notes: From "Invasive exotic plants to avoid in the southeastern United States", compiled for the North Carolina Botanical Garden by Allison Schwartz and Johnny Randall, Spring, 1999; and James H. Miller, <u>Nonnative Invasive Plants of Southern Forests</u> , United States Department of Agriculture, Forest Service, Southern Research Station, General Technical Report SRS-62, Revised December, 2004. Updated August 5, 2005.	